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Aeronautics

For Sportsman, Business Man and Pilot

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"A nation which possesses a strong air force and is content to wage defensive warfare on its own shores can afford to dispense with a navy."—Major W. C. Sherman in "Air Warfare."

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From the Publisher's Quill

"Simple Duty Hath No Place for Fear"—John G. Whittier

Shall We Have a National Air Academy?

RECENTLY AERONAUTICS came out strongly in favor of a National Air Academy and a separate and co-ordinated air ministry. Many of our sincere friends have volunteered the opinion that intrenched Bureaucracy would have us metaphorically drawn and quartered in consequence.

We were warned by these well-meaning people that public apathy would allow for only half hearted support, while a host of diehards and those who have a gainful or lucrative option on the present condition of things would smite us in lusty fashion; controlled advertisers would withdraw all patronage; we would be dryceaned and eased into oblivion.

A plain expression of truth in an industry honeycombed with internecine jealousies and puerile prejudices was presumed by some sort of magic to strike dead the unfortunate who gave it voice.

So far nothing has materialized except a notable expression of sympathy from a large share of the daily press, and a few of the usual large gestures from those who profess to believe that the present hodge-podge is the noblest possibility of our great democracy.

The contention of AERONAUTICS on this matter in short, is that it is unheard-of to secure anything resembling efficiency from a development whose control is scattered into the hands of a dozen bureaus.

It is our humble opinion that increased mobility of action will always destroy ponderous and unwieldy vehicles and that this is fundamental to both power and existence.

We believe that a free and impartial board of inquiry would develop the fact that one hundred million dollars' worth of aircraft would make the ocean highly unsafe for any battleships costing the same sum.

We feel that great commercial and national good can come from expenditures of sums comparable to army and navy appropriations, in the development of the airways, whereas the present military and naval establishments present a zero value except in time of war, when we believe their value without a unified air service under competent direction would be questionable.

It is our contention that a great new war academy of the air, to which qualified young men appointed by their congressmen would go after rigid examination, would do more for the country and the cause of aeronautics than any other large national expenditure.

Here under ideal surroundings with the attention of a great nation focused upon them, thousands of the finest of our young manhood would go for four years of stiff training. When they graduated they would be something more than pilots or engineers. They would be a group of men schooled to the finest tradition this country can offer. To them the air would be primary, subordinated to nothing but the common welfare.

An academy of this type would center attention upon aeronautics, and its development and experimental discoveries would offer untold value to civil as well as military flying: whereas the fine developments of our army and naval departments have added but little to the general public good in times of peace.

A fighting service and a school of the kind we propose would place America forever secure from the encroachments of enemies *and those potential enemies who find the payments of their debts to us increasingly onerous.*

Military masters of other countries are outspokenly dallying with the idea that a well handled and competent air force will annihilate all opposition within a few weeks, and this conclusion, fantastic as it may seem, has elements of probability.

This means a centralized air force—an air force schooled to attack, and not constituted in a number of minor units whose function primarily is the protection of land and sea forces to which they are attached.

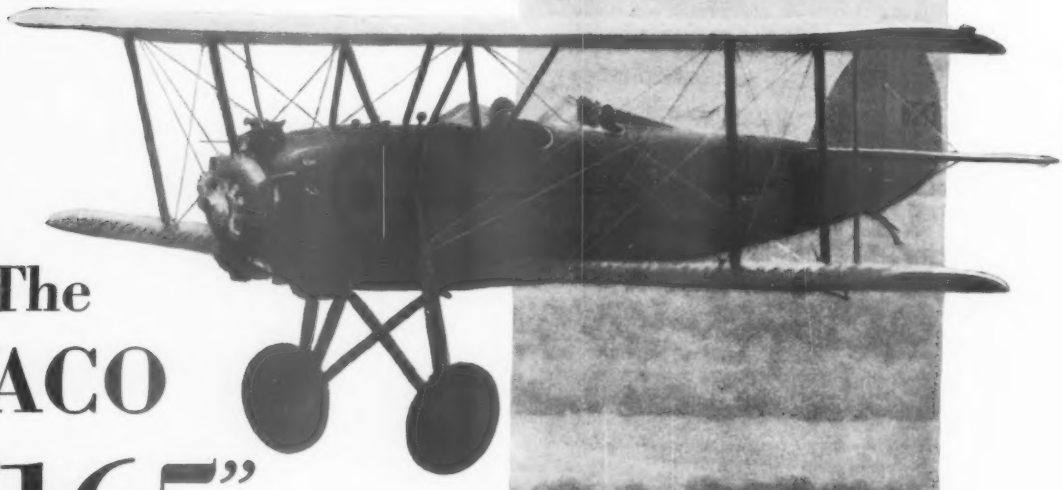
Napoleon, Cortez and countless others have amply demonstrated what the results are of more mobile weapons, cen-

(Continued on page 94)

Annapolis

West Point

A notable combination of a great airplane and a great motor



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HERE is every traditional feature of the dependable WACO airplane . . . plus the smoothness and power of the new J-6, 5-cylinder, Wright "Whirlwind" motor.

Here is a combination of snap and dash . . . a degree of beauty and comfort and safety . . . such as you've never found before in *any* airplane at *anywhere near* the price.

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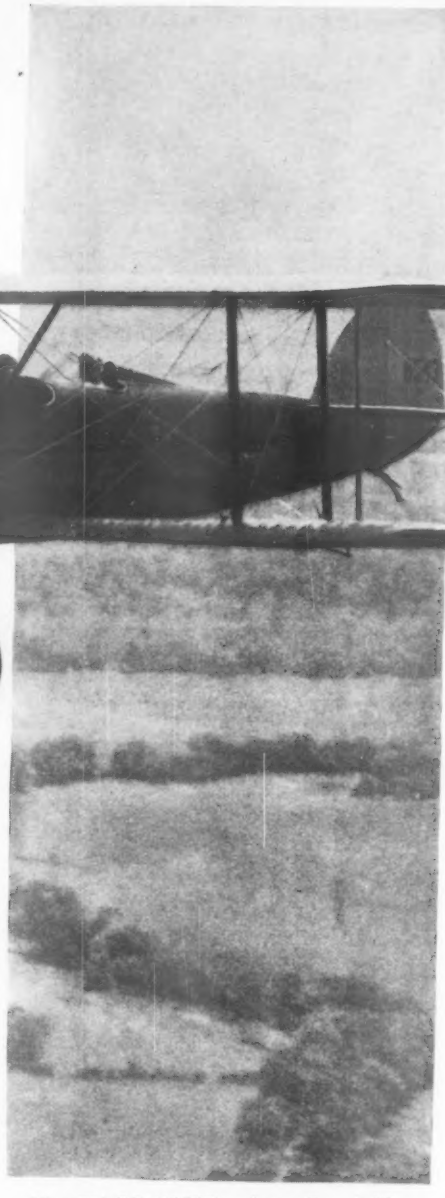

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SPECIFICATIONS

WACO "165" STRAIGHT-WING
J-6 Wright "Whirlwind" Motor
(165 H.P.—5-cylinder)
Wood propeller
Bendix brakes
Navigating equipment
65-gallon gas tank
3-place . . . Dual controls
Customer's choice of colors

$6370

(Add $275 for metal propeller)

Attack on Panama

By Rodney Jackson

The famous "Sea Hawk" trio leading VB-2B into action over the Panama Canal.

U. S. Navy Official Photo

CLIMBING the ladder from the forward gun gallery to the broad expanse of the "Saratoga" flight deck, I was almost unbalanced by the force of the gale that caught me unawares. As I pushed forward against it I hastily adjusted the chin-strap to save my cap from going overboard and when I reached the bow I jumped down into the starboard netting where a couple of other pilots from my squadron were already comfortably settled. The three leading fighting planes were being warmed up and would take off in a few minutes.

It was fascinating to lie just below the flare of the deck, strangely out of the wind, and watch the swift stem cut the white-capped Pacific seventy feet below. The slender bow slipped forward seemingly without effort, an irresistible force, and with incredible speed, even when viewed from seventy feet away. There was no ploughing through the water, piling up a foamy barrier the way the low squat battleships did at half our speed; rather was it the smooth slice of a fifty-foot express cruiser with a thin spray thrown back along the sides and the water curling in even waves from the trim water-line. It was hard to believe, watching that bow, that it belonged to the most powerful warship in the world.

The "Saratoga" was steaming almost due north, a few hundred miles off the coast of South America, and just south of the Equator. Since "war" had been declared a week ago as our fleet was cruising slowly down the coast of Mexico we had bent every effort toward a secret approach and attack on the Panama Canal, belonging to the enemy, and defended by an enemy fleet inferior to ours but including the aircraft carrier "Lexington" with her fifty airplanes, supported by the shorebased squadrons of both Army and Navy. While the main fleet steamed in from the north and west, the "Saratoga," accompanied only by the speedy light cruiser "Omaha," had swept southward in a wide circle to the Equator, and turning north that morning, had put on full speed for the final dash into Panama Bay. Enemy scouts, both surface and air, would be searching far and wide. Would we gain cover of darkness without being discovered? The next eight or nine hours were crucial to our success!

"Here they come!" somebody yelled and I raised my head above the level of the deck in time to see the leading fighter, with tail already elevated in flying position and motor wide open, moving forward into the forty-knot gale along the deck. Straight and true down the center of the deck she came, gathering speed until her wheels lifted as she passed us, ten feet from the bow. She was off! The pilot held his course level and straight forward and we turned to watch the next. The chocks had already been withdrawn from the wheels, and the deck officer, standing in front of the plane, was raising his arm for the pilot to open his throttle. The motor roared into life, and not many seconds after the first plane had taken the air, the second was leaving the deck to follow it.

This time the pilot gave us a thrill. The bumpy air around the bow and the slip-stream from the preceding plane made him swerve a few degrees as he started forward. Instead of straight toward the bow, he was coming at us! Three long seconds and still the pilot had not corrected his course; he had many other things to think about. At the last moment I ducked, watching the wheels and tailskid graze by a bare foot above my head; knowing that the whirring steel propeller would have left me minus an arm had I been rash enough to raise one. It was such moments that made watching the take-offs from the forward netting a never-ending thrill. But the plane was well away and the third single-seater roaring up the deck

as we cautiously raised our heads again. It took off a few feet from the bow and climbed rapidly to join the other two planes of its section.

Hour after hour the powerful ship forged northward towards its objective, officers scanning the horizon for signs of enemy destroyers, gun crews at their posts to repel possible submarine or air attacks, all pilots standing by their airplanes ready to start taking off on two minutes' notice. The three fast single-seaters patrolled the air ahead and twenty miles on either side of the ship, acting as scouts, with orders to return at top speed and report any sign of the enemy, on sea or in the air. Regular scouting planes were not desirable in this case, because a radio report would instantly give our presence and approximate position away to the enemy. As long as we maintained radio silence our scouts would have to report "in person" and the fastest single-seaters were best adapted to such a situation.

U. S. Navy Official Photo

Some of the Saratoga's fighters cruising through the battlefield of the skies.

It was planned to send out three successive patrols, with all the rest of the fighters kept warmed up and ready for immediate action. But even with those preparations it was known that should our position be reported early in the day and should the "Lexington" be within striking distance, we could scarcely hope to reach the cover of darkness with our plane-covered flight deck intact. One enemy bomb alone would raise havoc with those closely packed airplanes, while if three or four hits could be claimed we would probably be judged incapable of launching any of our planes the next day. Every officer and man felt the strain that morning. Pilots standing in little groups on the gun galleries or bracing themselves against the wind on the flight deck, eagerly discussed our chances of breaking through. Would we escape the enemy screen of cruisers and destroyers thrown out in all directions from Panama Bay to intercept us? It was inconceivable, and yet, as hour after hour wore on, we were still alone on the Pacific. Every watcher on the ship must have picked up a dozen dots on the horizon or in the sky that day, but always imaginary. We gulped our lunches, hating to waste those precious moments below in the wardroom, while still the gale blew over the deck, still the great ship of war ploughed northward, closer and closer to her goal.

It was not until three-thirty that afternoon that the spell was broken. As specks against the low gray clouds I saw our three scouts speeding back towards the carrier. The leader dived and zoomed alongside the deck and we could not doubt that they had sighted the enemy! The plane turned, and floating across the clear deck near the stern, dropped a hastily scrawled message in a little weighted bag. The rumor quickly went the rounds that it was an enemy destroyer, and in less than ten minutes we had sighted him off the starboard bow and our radio operator had intercepted his contact report. The enemy knew our position and course! It would be dark in less than three hours—was the "Lexington" close enough to send out her planes for an attack and still have time to land them all aboard again? For three hours we paced the deck, but not an enemy plane appeared.

As we were still four hundred miles south of Panama there seemed little chance of successfully completing our mission, yet there was always hope. Our long range guns soon theoretically crippled the destroyer, which was reduced to half speed and was therefore powerless to trail us. The order to darken ship was given at sunset, but as the welcome dusk began to close about the carrier, an enemy cruiser was seen coming over the horizon far to the northwest. Our planes had been landed and it was too late to send any off to attack, but a theoretical gun duel was engaged in by both sides for the few minutes before darkness. She disappeared from view and we all hoped we had escaped.

After supper that night I climbed the ladder again to the flight deck. It was my turn as squadron duty officer, with responsibility for seeing that the Vought "Corsairs" in our scouting squadron were moved about the deck in safety and were lashed down securely after they had been "spotted" for the coming take-off. That wind, straight out of the north, had increased if anything since sunset, and the "Saratoga" had certainly not slowed down. She must hold her pace, within a few knots of top speed, in order to reach her scheduled five o'clock position the next morning under the protection of a division of friendly battleships.

It was a dark night—in fact it was one of the darkest nights I have ever tried to see through. The overcast sky shut off all but occasional glimpses of the moon. The foamy wake which ran alongside I knew belonged to the "Omaha," looming as a black shapeless mass off the port bow, but not a light was showing on either ship; not even the flicker of a match or the gleam of a pocket flashlight should be allowed to disclose our position. The lookouts continuously searched the darkness and the guns were manned to repel a possible submarine or destroyer torpedo attack, but we could have slipped by within two miles of the whole enemy fleet that night without being discovered.

Scores of airplanes had to be moved into position before morning in the wind and the darkness. For awhile I watched the hard-working handling crews bring the squadron of big Martin torpedo planes up the elevator from the hangar deck. The scouts and fighters must remain crowded up forward until these eighteen dreadnaughts of the air were in place. One by one the elevator brought them up and before it had come to a stop men were swarming about the plane, freeing the wheels from the chocks, pushing it aft to make room for the next. Wing-folding crews, who made records by daylight, climbed over each plane, spreading the wings, driving their bolts, locking every part in position, and working faster than ever, it seemed, in pitch darkness. After the

torpedo planes came half a dozen amphibians, two-seaters carrying radio, each of which acted as a liaison plane for one of the regular squadrons. Then the scouts, two squadrons of them, were rolled back out of the melee of planes at the bow. There would be no need for scouts in finding the Panama Canal, so these versatile "Corsairs," each capable of carrying a five hundred pound bomb slung under its fuselage, were to form a separate bombing group. Finally the light bombers and fighters, dozens of Boeing single-seaters, covered the forward part of the deck. Working for almost eight hours in a forty-knot gale, with the darkness so intense that you could not read the two-foot black number on a white fuselage six feet away, those uncomplaining handling crews moved every airplane out of that scramble to its appointed position, spotting them so that every airplane in every squadron would take off in the correct order. And they moved them all safely! Not a rudder was damaged, not a flipper bent, not even a wingtip scratched!

My work had been done before eleven o'clock when I had inspected the lashings of tails and wings and wheels of the airplanes of our squadron. I made sure that each was secured by the proper number of lines, mainly by stumbling over them all, and I might have gone below to turn in as all the other flyers had done. But there was that tension in the air—dark forms of planes being moved down the deck, enemy subs lying in wait for us, destroyers scouring the black surface of the Pacific, that unremitting wind that seemed almost of hurricane force at times—and everything conspired to keep the idea of sleep farthest from my mind.

Besides, with my "Corsair" being equipped with amphibian gear below in the hangar, and as yet unchecked and untested, I was one of the few pilots aboard who was not going to help destroy the Canal. So it was two o'clock in the morning, after having watched the last plane being lashed into place, and after having listened (junior officers, like children, should be seen but not heard) to the talk of the lieutenant-commanders in the Pilots Ready Room, before I finally dropped below for a brief nap in my bunk. Now that the work was finished and the strain of the long day ended, a spirit of optimism pervaded all officers, or rather those few who were still awake. The planes would be on their way in a few hours, what could stop the attack after that?

It seemed but a few moments after I had dozed off that I was sitting up in my bunk again. Bells were clanging, two bells signalling "flight quarters," all over the ship. My clock told me that it was 3:30. In two minutes I was dressed and on my way up the gangway, eager not to miss the smallest detail of the coming take-off.

All aviators had been called half an hour before to let them gobble a hurried breakfast, so by the time I reached the Ready Room almost every bit of available space was occupied, with helmeted flyers spread over most of the floor as well as draped over benches, chairs, and the table. All ports were sealed tight, and wiring connected with the doors put the room into total darkness every time anyone came in or went out to the flight deck. It was a very sleepy crowd of flyers in the Ready Room that morning, with conversation limited to monosyllables even when coffee was served by the watch-boy. They grumbled about being pulled out of bed at such a ridiculous hour, or about how uncomfortable a mattress the table was making, with never a word of what was uppermost in every mind—the coming take-off in pitch darkness and the hundred-and-fifty-mile over-water flight into Panama Bay. Mechanics warmed the motors up out on deck, but inside in the dim light there was mostly silence from a hundred odd naval aviators.

The U. S. S. Saratoga going through one of the locks of the Panama Canal.

Over an hour dragged by before the word was passed over the loudspeaker, down from the bridge, to "Man all planes! Man all planes!" An eager swarm of flyers tumbled out of the doors of the Ready Room, and as the grinding of the inertia starters was heard over the deck, I clambered up the side of the forward eight-inch gun turret, on top of which was the best point of vantage to view the launching of the planes. Starter after starter was engaged with its motor, and motor after motor joined the general uproar, while circles of little blue exhaust flames appeared all down the deck.

Here were hundreds of lights that could hardly be hidden, but the chance had to be taken. For several minutes pilots warmed and tested their motors, and finally at five o'clock, still an hour before dawn, the Admiral himself gave the word for the "Saratoga" to launch her planes.

The leading fighting pilot opened his throttle, eased his tail up parallel to the deck, and was off. Up the deck into the teeth of the gale, a hardly noticeable dip off the bow, and he was climbing into the darkness, with only a small white running light on his upper wing and the fast-disappearing blue exhaust circle to let us know he was in the air. Already a second, and then a third, and fourth, and fifth plane, had burst forward, almost as if catapulted into the night. The first six planes had formed sections, rendezvousing in a straight line ahead, before I lost sight of their running lights in the distance, and many, many others were following them by that time.

The only two lights on the ship were the dull red and green flashlights held by men in the port and starboard nettings at the bow. Designed to outline the forward end of the deck for the planes heading off into the darkness, one or the other of the lights had to go out for a few seconds on almost every other take-off as its holder ducked beneath the level of the deck. New propellers constantly added to the turbulence of the air, and there were few pilots who could hold a true course between those lights at the extreme bow. I listened anxiously to the beat of the motors, all Pratt & Whitney

(Continued on page 92)

Working

By Helen Kay Schunck

"WHAT the Hell do you want?" shouted an irate Irish attorney to a sturdy, ruddy cheeked, slightly bald, nervous man who was pacing back and forth between the bench outside the Contracting Officer's private office and the partition dividing the reception room from the attorney's office.

"Nutting, nutting," murmured the foreigner as he hastily turned and regained the safety of the reception bench.

And we, who had been watching the proceeding, almost choked with amusement. The man so summarily put in place was none other than Anthony H. G. Fokker, the famous Dutch airplane designer and builder who was paying his first visit to the United States, and on that particular day in November, 1920, to the Engineering Division of the Army Air Service at McCook Field, Dayton, Ohio.

Probably no other celebrity was more welcome. Not that there was not bitter opposition from some quarters; there was, for some of our countrymen were still too much imbued with war time propaganda to really welcome the man who was responsible for Germany's supremacy in the air. But the war was over; Fokker was not a German; he was a Dutchman who had, by force of circumstances, manufactured planes for the enemy instead of for the Allies. He was by far the most renowned airplane designer in the world, and there was no reason why the United States should not take advantage of his skill and experience, which had cost us sufficiently dearly without our having a single one of his airplanes except those captured from the Germans.

It was typical of America that the man who had been sought and pampered by most of the Governments of Europe should have been hailed here by "What the Hell do you want?"

I little dreamed that day that I was going to be in position to know Fokker intimately in the years to come. My memory of that time associates him with fur lined coats and movie cameras. Everywhere he went the "cinema," as he calls it, was dangling from his shoulder; and he insisted on using it in the most unusual places, as, for instance, on the 59th Street Bridge, in New York, where his parked automobile was bound to hold up mighty badly tempered traffic while this man Fokker crawled to the top of the steel beams of the bridge in order to get a better view of the scene he wanted to photograph.

Several years intervened from that time until I met him again. The second time was five years later, again in November, this time—1925, just after the first Ford Reliability Tour when he came to McCook Field in his "Trimotor," the three engine transport which was the marvel of that Tour. To show Fokker's genius: this particular ship was the first of its type, built by his Amsterdam factory in accordance with cabled instructions from him from New York. Fokker brought that ship to McCook and turned it over to the Field for any test it might care to make. That was the first time a manufacturer of a commercial plane had done that, and every officer on the post wanted a chance to fly the big graceful monoplane, and every civilian wanted to ride in it. Fokker was graciousness itself. He allowed the officers to use it as a baby carriage, taking their wee infants up for a baptism by air, and he kindly arranged a number of flights for the stenographers on the Field. Luckily, I managed to be among the ones thus favored. It is not usual for me to be numbered among "Mary's Sons," but this was an exception. The ride was superb. Fokker was in his glory, at his best, in a gay mood, and why not? His latest brain baby was meeting with unqualified approval.

XUM

with a Genius

Illustrations by John Rogers

Where scepticism and criticism usually attended the tests of a new product, this one was hailed with approval. The cabin was full of girls, most of them up for the first time, and nothing delighted Fokker quite as much as leaving the wheel to step down into the cabin, allowing the ship to fly itself, which proceeding was greeted with screams of terror from the majority of the occupants of the cabin, even though the big ship would only gracefully glide downward, straighten itself out, glide, straighten,—until he again took the wheel.

The ride was so perfect that I wanted more, and I decided to try to get it. The next morning I eventually convinced another of the enthusiasts — Miss Marguerite Jacobs (now so well known to the readers of aviation literature under the name of A. M. Jacobs) — that there might be a chance for a cross-country trip. But how were we to go about asking for it? The request was certainly presumptuous; yet, we decided to do it, in writing. Notes were despatched to Mr. Fokker; hers, painstaking; mine, merely informing him that I was only good for ballast.

Shortly after lunch that day—it was on a Thursday—the door of the office was flung open, there was a swift patter of steps, and I recognized the foreign accent of Mr. Fokker asking for Miss Jacobs. I hesitated, but eventually worked up the courage to be presented to him. His first remark was:

"So, what you are good for?"

"Nothing," I replied.

"You are not good for anything?" wondering, I suppose, how I happened to be connected with the Field if that were the case,—for although I have occasionally been accused of being dumb, I have never been credited with being beautiful.

Miss Jacobs interrupted to explain that I was one of the secretaries.

"You write letters?" he asked.

"When necessary," I replied.

"How would you like to work for my Mr. Gott?" That was a bomb. Mr. E. N. Gott was the former President of the Boeing Airplane Company, Seattle, Washington, whose services had been secured by Mr. Fokker to act as his Sales Manager, and whom I had known for years. I explained that to Mr. Fokker and was immediately asked if I would do some work for him after hours. I was delighted. But the matter of our cross-country flight was not decided.

He did not know when he was leaving; we did not care. He did not know where he was going; we did not care. Finally, he did not want to make any promises —and there the matter rested.

After the Field closed, he came in to have me write some letters for him. That was fun. His dictation was a puzzle, and had I not been familiar with the subject, the result would have read like a telegram reduced to its least common denominator. I have discovered since that he dislikes to dictate; he usually is so tired when he does get at his correspondence that he goes to sleep after the first letter,—and the rest may go unopened for a month.

My work seemed to satisfy him, so I decided to reopen the subject of the trip.

"Mr. Fokker," I said, "shall I bring my tooth brush in the morning?"

"What iss that?"

"Shall I bring my tooth brush? That is all the travelling equipment I actually require."

That amused him, and when I eventually was dismissed it was with the remark: "Well, I do not promise, but if I were you I would bring the tooth brush."

Miss Jacobs and I both came out the following morning with our travelling necessities, but we had carefully made them as inconspicuous as possible for we feared we might have to take them home without having been out of town. But the day was too foggy for flying, and although Mr. Fokker came in to have more letters written, not a word was said about the trip. That night Miss Jacobs and I had a good night's sleep; we had decided that the trip would not materialize.

Saturday was a glorious day. But what of it? The ship was taken out of the hangar. Suddenly, I realized that I had never wanted anything in my life as much as I wanted a trip with Mr. Fokker in the glorious Trimotor. All at once the door was flung open, hurried steps approached, yes, turned in at the door of my office, and Fokker in his fur lined coat and helmet, with dancing eyes, shouted—

"Bring your tooth brush and come; I have taxi waiting to take you to the ship."

Did we hesitate to cash checks or fill in the leave cards which Government regulations absolutely required? We did NOT: We grabbed our luggage, donned our coats and hats, and ran to that taxi. Pepsodent smiles had nothing on ours. But the pilot was late. Fokker was incensed; he started the engines himself, and when the pilot did appear greeted him with— "Here iss my opera singer; he iss temperamental." You can imagine the reaction of the pilot to that reprimand, delivered in the presence of a number of Army officers, particularly when he was late because he was attempting to repair a compass which he wanted to use on this trip.

Where were we going? We had forgotten to ask, but it proved to be Detroit where Mr. Fokker had a luncheon engagement.

The trip was magnificent. Fokker delights in playing to a gallery, so he put on a demonstration at Dayton and one at Detroit before we landed. He loves

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B. C. Forbes on Perils of Too Rapid Expansion

By B. C. Forbes
and
R. W. Schabacker

There is a fine relationship between any one industry and business in general, and no discussion of aviation finance could be complete without an understanding of conditions in all other fields. This composite of American Business is Mr. Forbes' contribution to this complete understanding.

THUS far in the second half of 1929, those prophets who looked for decided business depression remain without honor. There has been a slight let-down in industrial activity throughout the country but it is almost entirely of a seasonal nature and reflects shifting of mechanical production lines, inventory shut-downs and Summer vacations more than any weakness in fundamentals of supply and demand.

Rather than being an unfavorable factor, such slowing down as has occurred is probably a point of potential strength. Industrial activity in several key lines during the first half of the year had reached levels that even the most optimistic could not have expected to last throughout the year.

Perhaps the most striking example of an industry running far ahead of its accepted normal rate was the motor group. Starting the year with an output almost double the previous year, production schedules held high throughout the entire first half-year. April set up a new high record not only for 1929 but for all motor car history, at over 620,000 units produced in the United States, a gain of 200,000 cars over the same month of last year.

Figures for May fell off only slightly. Total domestic motor car production in the first half of 1929 has set up a new high record for all time at well over three million units, a gain of approximately 50% over the 2,100,000 output in the first half of 1928.

Even with the public in a buying mood, with active movement of used cars and constant growth of exports, there is little doubt that the pace was too fast to last, and while it was encouraging to see how output and sales held up in previous months, it is also encouraging to see leading makers toning down their operations in an effort to avoid what must otherwise have developed into certain over-production and over-stocking of dealers.

That second-half production or sales in the motor field will reach the record-breaking proportions of the first six months cannot for a moment be expected.

The theorists who prophesied general business reaction for the second half of 1929 took their cue chiefly from the old theory that high money rates, if continued over a fairly long period, generally serve to check business. The basis for the theory lies largely in the check which high money rates exert upon new financing by fixed-interest-bearing securities. There is no question but that bond financing has been thus affected, total domestic issues sold in the first half of the year having been barely 50% of the volume put out in the same period last year.

On the other hand, corporations seem to have all the funds they need and are even loaning heavily in the call money market. The recent era of speculation and stock market popularity has made exceedingly simple the equally attractive process of raising new corporate funds by granting "rights" to purchase additional common stocks, and this road to corporate financing has been heavily patronized during recent months. The chief potential danger to prosperity appears to lie in the temptation for corporations to utilize their spare funds by loaning them in the call money market at high rates instead of using such funds for legitimate business expansion.

The decline in nation-wide building figures thus far in the year may be

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Aeronautics

The interest in aeronautical stocks is so great, and so much divergence of opinion exists as to their comparative value, that AERONAUTICS has decided to put out a special issue twice each year, of which this is the first, giving the opinions of those financial leaders whose information is first-hand and whose authority is unquestioned.

We have endeavored not only to show the present position of aviation securities but also the mass relation of the industry to general business.

Those contributing to this issue are:

Roger Babson, who needs no introduction and who has developed what is certainly the most complete commercial Statistical Service the world has ever known.

Roger Babson Discusses Selecting Aeronautical Securities

COMMERCIAL aviation is already an accomplished fact. This industry will play a central role in the next great revolutionary development in business, finance and social economics. A forerunner of such development is the public's present appetite for aviation stocks, both transport and manufacture. As I have already pointed out, all aviation stocks cannot be sound. Like every other new industry, aviation will be exploited by swarms of greedy promoters. In fact, aviation, because of its spectacular and romantic appeals, will be peculiarly a prey for unscrupulous promotion.

Having in mind the precedent of many of the radio companies it has been thought that many of the new aviation companies may flourish from the very start. Such however is not the history of industry in general. Precedent is rather on the side of those who forecast that the aviation industry is likely to have a taste of reorganization before it becomes financially established. Certainly aviation will be an exception to the rule if it does not have to pass through a reorganization stage before its securities as a group reach an assured basis. Financial annals clearly teach that those who indiscriminately invest in a new industry because of its general glamour soon lose the glamour and eventually a large part of their money.

It is impossible to get a clear and comprehensive vision of the aviation industry unless you study its effects upon other industries and activities. No business can be fully visualized except in its entire economic setting. As an example of these principles we have only to recall the development of the automobile. Although the growth of the automobile plants themselves has been gigantic, economic and social changes of even greater scope have accompanied this development. Individuals, enterprises and communities, far distant at first from the automobile and apparently immune from its influence, found themselves either princes or paupers.

The automobile, for instance, led to the *depreciation* of hundreds of millions in the securities of street railway companies and simultaneously brought about an even larger *appreciation* in the securities of oil companies. Incidentally, I think that some oil stocks are selling for a fraction of the price they will ultimately command. The influence of the automobile industry has been far reaching in the extreme and similar tendencies will accompany the growth of the aviation industry. In studying the aviation industry, therefore, watch not only its actions but its reactions.

Airlines vs. Railroads

The railroads and the equipment companies represent one of the industrial groups that will be most vitally influenced by aviation progress. Except for suburban traffic the railroads seem likely to lose gradually most of their daytime passenger business, practically all their first class mail business and light express business. This will be the tendency as there develops a more nearly universal use of private automobile motor coaches, and now, as a final chapter, the vehicles of aeronautics. Railroad officials have sometimes told me that they would welcome a reduction of passenger traffic as it had always been unprofitable. Theoretically some of the roads might do better business if their business consisted only in handling freight and through Pullman cars.

However, where a road gets 35% of its gross from passenger traffic as does the New Haven, and is located at the mercy of airplane competition, it cannot afford to view the development of the industry with indifference. The New Haven, for example, in order to offset airplane competition would have to operate trains northward from Boston in

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Financial Number

B. C. Forbes, Editor and Publisher of Forbes Magazine, who is rated the best known financial commentator in America.

J. Allen Grover, whose direct connection with the aviation investment field enables a close-up view of the situation.

R. D. Small, whose previous articles in AERONAUTICS have developed a wide following.

AERONAUTICS at all times stands ready to assist its readers in the proper selection of aviation securities and its corps of experts will answer all questions relative to offerings in this field.

Our financial department will continue in each issue as usual, with an additional special financial number twice each year—the next to be the February issue.

The Publisher.

Investment Possibilities

By R. D. Small

Gen. Mgr. of Aviation Financing and Trading

MR. RENTSCHLER, President of United Aircraft and Transport Co., concentrates on the most vital necessity in the further growth of the aeronautical industry when he says, "Sound engineering development, not capital, is what aviation needs most today." The glamour connected with the names of wealthy men, and also the glamour of large capital neither insures adequately managed companies nor successful aviation investments. Within the last ten months a glittering board of directors, and ample funds, have not proven to be the indispensable factors to develop sound aviation enterprises. Brains and experience, and engineering appear to be the three indispensables required in this rapidly changing industry. Several corporations have been launched with a great blare of trumpets, but have not evidenced thus far the expected headway, and their securities are selling well under the original offering price.

It is now being considered a very lucky occurrence that the decline in the general market happened at the opportune period when aviation securities were on a rampage, and many of them were advancing without rhyme or reason, simply on "guesses," and "hopes," and "estimates" of the houses sponsoring them. The boom in February and March marked up many securities to an extraordinary price level. There were not sufficient earnings to back up this level. If prices had progressed much further in the upward direction there would have been a crash, and the industry would have gotten a reputation for "wildcatting." As it is, much of the "blah" incidental to any new industry has been boiled out, and while in line with the general market most securities are lower than they were sixty days ago, it is generally believed that it is much safer to invest now than during the pioneer stage.

Mr. Hunsacker of the Aircraft Finance Company is credited with the statement that there has been $255,384,523 new capital invested directly in Aviation enterprises in the last sixteen months, and that in May of this year there was invested $64,450,625. It is particularly fortunate that the industry almost immediately secured the interest, enthusiasm, and backing of many of the most successful business men in the country.

A recent development should greatly stimulate the sales of planes. Under new pending regulations the Department of Commerce will permit a license to be issued to the *purchaser* of craft, even though only partial payment has been made. Hitherto the financing company was held responsible for the acts of the pilot purchaser, and this has greatly retarded the merchandising of planes. In this connection it should be remembered the biggest growth in automobile sales only came after the larger companies had worked out their deferred payment plan. A similar expansion is now expected in the airplane industry.

The writer has been importuned frequently to suggest a list of a few companies whose securities represent the best potentialities, and which should give a satisfactory account of themselves during the next three years. The first six are offered without any detailed analyses (as these have already been published in the financial columns). Only the vital points are stressed. Too many shares, or an unwarranted market price precludes suggesting several other sound companies.

1. United Aircraft and Transport represents one of the best rounded out consolidations in the entire industry. The Boeing plant, with 1,350 employees, is the largest factory in the United States devoted exclusively to manufacturing planes. It has produced 43 models, weighing from 2,400 pounds to 27,000 pounds. It is the most self-contained airplane factory in the United States. The Boeing system, including the Boeing Air Transport, Pacific Air Transport, comprehends one of the largest transport systems in the world. It has recently completed flying the five millionth mile on schedules, over established airways. Within the last 60 days Boeing acquired the Stout, Detroit, and Cleveland Airlines, and will operate 24 place seaplanes with tandem mounted motors between Detroit and Buffalo. With the control of the Pratt & Whitney line of motors, Hamilton propellers, Chance Vought planes, and its many other activities, this consolidation is one of the most self-contained of any in the field. The common stock, which was brought out under 80, rapidly soared to 162, dropped to 104, and today sold at 137. This company has an excellent management and sound financial backing, represented by National Company, identified with National City Bank.

We suggest the ($50 par) preferred issue, because of its cumulative preferential 6% dividend which is now being earned, and because up to November 1, 1938, it carries a warrant permitting the purchase of one share of common for $30.00 for each two shares of preferred owned. Preferred is now selling at 89. This company occupies one of the two most important key positions of air transportation in the United States. Revenue for the first quarter—$5,982,208.70; net earnings after deducting all charges—$1,816,151.91, or after paying preferred requirements at the rate of $4.00 per annum on common.

2. Of all the so-called Curtiss-Keys companies we believe the Curtiss Aeroplane & Motor Co., on account of its being the oldest and having secured a highly capable and seasoned organization, and having demonstrated its earning power, and its intention to remember stockholders in the form of split-ups, stock dividends, rights, etc., represents one of the half dozen most attractive securities. In line with the progressive tendencies of its Chief Executive, Mr. Keys (by many considered the most dynamic personality in the industry), the recent plans to develop China by transport routes connecting four or five of the largest cities will naturally involve purchasing aircraft made by the Curtiss Company, which will open up the Orient to this corporation. The recent purchase of the Pitcairn route from Washington to the tip of Florida represents similar new business for their factory. Only this month Curtiss Aero Export Company, affiliated with the Curtiss Aeroplane Company, bought a 1,100-mile Peruvian transport line, which inaugurates the Curtiss activities in South America.

The ramifications of the 18 or 20 companies included in the so-called Curtiss-Keys group all have some relationship to and assist the earnings of the older company. We cannot conceive of the next ten years' unfolding of the industry, without recognizing a prominent place for this company in that development. Stock is traded on the New York Stock Exchange. Market today is 162.

The Press has just given the outlines of the Curtiss-Wright consolidation, which will represent a holding company with 2,000,000 shares of $2.00 dividend "A" stock, and 10,000,000 shares of common stock, to take over the Curtiss Aeroplane and Motor, Wright Aero-

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Monthly Financial Review

By J. Allen Grover

FOR a month the stock market has suffered from an acute attack of uncertainty which has robbed it of all but the barest trading interest. The public was badly frightened some weeks ago by the steady decline in security prices and withdrew from participation on an active scale. Then professional traders themselves, unable to make up their mind as to the trend for the immediate future, reduced their operations to a minimum, so that the market has been extremely quiet. Trading on the New York Stock Exchange has frequently fallen below three million shares a day.

During the month one of the bearish factors which had affected the market adversely was successfully cleared up. This was accomplished by a working agreement finally being evolved by the Reparations experts at the conference in Paris. A discussion of the final terms would be out of place in this column, but the effect has been felt throughout the entire world. The German economic situation has passed its crisis and a more workable plan has been evolved which will scrap the Dawes' plan payments that were too heavy for the economic structure of Germany to withstand.

The main thing, so far as we are concerned, is that another element of uncertainty has been removed, and that the European economic structure which is an interdependent factor with our own economic position is again in a sounder, if not completely satisfactory, position.

The other factor which disturbed the market last month was the fear of high call money rates during the middle of June when income taxes and heavy dividend payments fell due. This has now been successfully passed, with very little obvious strain on the money market, largely of course because the stock market has been so quiet that its demand for funds has been at a minimum. There is still left the mid-year period around July 1st to be got through as best as possible and while it does not seem that money will be as easy in the next few weeks as it has been, still it seems highly unlikely that there will be a real money pinch.

Aviation stocks sold off with the rest of the market, but there were no bad breaks in any of the issues, and occasional weaknesses here and there were doubtless attributable to withdrawal of pool operators who found it necessary to protect other interests during the decline. On the whole, aviation stocks have given an extremely good account of themselves, considering the unseasoned

character of the various issues, and it is gradually being proven that the friends of the aviation industry in finance are strong people with tremendous resources and an unbounded faith in the future of the industry.

New Companies

Porterfield Aviation Interests, Inc.—Announcement has been made of the formation of a new $25,000,000 holding company, closely affiliated with the American Eagle Aircraft Corporation. At a special stockholders' meeting of the American Eagle Company, a proposal was passed, authorizing an increase in the capital stock from 200,000 shares to 2,000,000 shares. One share of the present outstanding Common will be exchanged for two shares of stock in the new holding company. In addition, each stockholder of record June 1st receives the right to subscribe to one share of the new company's stock for each share held, at $3.75 per share. No stock of the Porterfield Aviation Interests, Inc., will be offered directly to the public, but the unissued shares will be used to acquire additional units. The first company to be absorbed will be the Lincoln Aircraft Company, Inc., although no definite information was given as to what the rate of exchange of stock would be.

Southern Skylines, Inc.—The formation of a new company under the above title was announced to operate a transcontinental-coastal air rail passenger, mail and express service. Hon. Wm. G. McAdoo is to be Chairman of the Board, but as yet no further details are forthcoming.

Atlantic Marine Airways, Inc.—This is a new transport company formed in Massachusetts with an authorized capitalization of 20,000 shares of no par Common Stock. The object of the company's services will be to supply transportation to various summer resort towns and will consist of regular schedules between Boston and Cape Cod resorts and Martha's Vineyard.

Detroit Aircraft Corporation.—This company was formed last week under the laws of Michigan with an authorized capitalization of 2,000,000 shares, of which 887,769 shares are to be outstanding. The new company represents a merger which has been discussed for some time and takes in the Ryan Aircraft Corporation, the Aircraft Development Corporation, Aviation Tool Company, Grosse Isle Airport, Inc., Marine Aviation Corporation, Lockheed Aircraft Company, Eastman Aircraft Corporation, Winton Aviation Engine Company and Blackburn Aircraft Corporation.

Of the authorized but unissued shares, 300,000 are under option to bankers at a price not less than $10 a share, and 16,000 shares are reserved for purchase by certain employees at the same price.

A syndicate, headed by August Belmont & Co., of New York, has offered 320,000 shares to the public at $15 per share. The acquisition of the Lockheed Aircraft Company will result in an exchange of stock requiring the further issue of 184,310 shares of the Common Stock of the Detroit Aircraft Corporation.

Great Eastern Air Terminals, Inc.—Has been incorporated in Delaware for the purpose of acquiring land, constructing and operating a large air terminal which will be located at Whitings, N. J., close to Lakehurst.

The capitalization of the company consists of 600,000 shares of no par Common Stock authorized, of which 100,000 shares have been issued to the organizers for options on land, designs, etc. A further 100,000 shares will be held in the treasury and 400,000 shares will presently be offered to the public by a syndicate whose names were not revealed, at $15 a share.

Mergers and Consolidations.—The Simon Airplane Appliance Company and the Heywood Starter Corporation have proposed a merger to their respective stockholders. Shares of both companies will be exchanged on a share for share basis for the stock of a new company to be known as Airplane Equipment

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Air Service Views of Congressmen

By Fred DeWitt Shelton

THERE certainly is no lack of interest on the part of Congress in the air services of the Army and Navy. An inquirer finds most any Senator or Representative with quite positive views as to what national policy should be. There are sharp differences of opinion. Considerable feeling has grown out of some of these differences. Congressmen, therefore, are reluctant to speak for publication about some of these disputed questions.

Representative John J. McSwain of South Carolina, as a member of the House Committee on Military Affairs, has fought many intra-committee battles over aviation policies. He won his spurs in the World War as Captain in the 154th Infantry. He now believes a better day is dawning for the air services. When approached by the writer for a statement of his views on the present status he declined to be drawn into a debate on the relative merits of conflicting aviation programs. He voiced his constructive ideas, however, freely.

"The five-year program for the air services of the Army and Navy," said Representative McSwain, "has more than fulfilled the prophecies of its promoters.

"The procurement law which was enacted contrary to the recommendation of the Morrow Aircraft Board and contrary to the advice of the War and Navy Departments has proven a blessing to the cause of aviation and to the Treasury of the United States. That procurement law needs to be amended in two respects and doubtless will be so amended in a year or two.

"The single greatest need of military aviation is the consolidation of all aeronautical activities under one head in order to prevent duplication and to insure efficiency.

"From the point of view of national defense the greatest need is to encourage civil aeronautics. In the next five years we ought to multiply by ten the number of National Guard units in aviation. We ought to train in our flying schools five times as many young men as we are now training. We can attract a fine choice of young men who are glad to come to the flying school without salary in order to receive free training and subsistence. To the pick of the men who come out of these schools we can offer commissions in the air service.

Owing to the unexpected illness of Congressman Fiorella H. LaGuardia, the article by this well known Representative from New York, will not appear in this issue of Aeronautics.

"If we would put the price of one battleship or two cruisers into aircraft and air training, in addition to what we are now doing, in five years our air defense program would be nearly complete.

"One very important thing is to encourage, by promotion, cash bonuses and citations, improvements in efficiency and safety devices. This would stimulate constructive thinking and planning by men who are in daily contact with aeronautical problems. I am sure such inducements would result in highly valuable developments."

On the civilian side of aeronautics, perhaps, no member of Congress has played a greater part than Representative Clyde Kelly of Braddock, Pennsylvania. Ever since the close of the World War he has worked zealously for promotion of air mail service as a postal facility of prime importance and as a practical means of building a commercial aeronautical industry to furnish a peacetime reserve for national defense.

Mr. Kelly successively sponsored five air-mail bills which became law. Air-mail lines now covering 58,000 miles daily are a monument to his persistence.

"For years I have held the view," said Mr. Kelly, "that the important thing in aviation is to develop the civilian side of it. As a matter of national defense we need a great reserve of men trained in aviation and industrial plants, and transport organizations, all of which could be called upon in case of war.

"We need the best possible air service in the army and navy, of course. Congress is anxious to do what it can to provide that. The War and Navy Departments are doing a splendid job in experimenting with planes, materials and equipment. They are providing training for pilots and mechanics, many of whom enter commercial aviation.

"They provide a market whereby manufacturers are encouraged to build up aircraft manufacturing plants.

"But we can not hope to maintain a military air force that would prove adequate in time of war. In such an emergency we would have to recruit from private life twenty times the personnel of our peace time air service.

"It early appeared to me that the development of an air mail service was the most practical and economical way to build up our air service resources. As a boon to commerce the air mail system has proven its worth. It furnished the backbone of what has become a nation-wide network of prosperous commercial air transport lines.

"Last year we reduced the air mail postage from 10 cents to 5 cents. I doubt if the rate will be reduced much further. The differential of 3 cents over ordinary first class mail is a small premium to pay for the much faster air mail delivery. The present 5 cent rate has been a tremendous impetus to the air mail. The volume carried has grown so that already the Postmaster General has been able to negotiate contracts with carriers at lower rates.

"Thus far the air mail service has not paid for itself out of postal revenues. It is only a matter of a short time, however, until air mail deficits will be wiped out. Then the public will have fast air mail delivery at no cost to the general Treasury and the air mail contractors will enjoy revenues that will enable them to expand their facilities, extend passenger and express service, and build up an industry that will add immeasurably to our national security.

"With a nucleus of trained men and modern equipment in the Army and Navy, with great numbers of pilots, mechanics and managers in commercial aeronautical enterprises, with airports at every center of population, with aircraft manufacturing plants operating on a sound financial basis, and with established air transport lines serving every part of the continent, I feel that our national defense from the air is pretty well taken care of."

Aeronautical advertising tells much of the story of aeronautics in America. Full page spreads announce to the world that Kansas has taken to the air. The city

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Bumps

By M. Luckiesh

Director Lighting Research Laboratory
National Lamp Works of General Electric Company

Dr. Matthew Luckiesh has written a number of articles on meteorology for *Aeronautics*. This is one of the most interesting, dealing, as it does, with "the detour signs of the air."

NO highways are perfectly smooth for long distances or for a long time. Bumpiness develops here and there. Aerial highways are not exceptions although the bumps generally change in intensity and in location with the air-currents. For the most part bumps in the air are not more than annoying but they can be of sufficient magnitude to be dangerous. Generally they are most dangerous near the ground but they can cause difficulty, particularly to newly initiated flyers, at any time. Certainly, knowledge of their causes and of the likelihood of their presence is good equipment for the aerial traveler.

Bumps are encountered throughout the altitudes in which most flying is done. They are to be found in the entire cloud-region below the cirrus clouds. They are not uncommon up to 15,000 feet but they are most prevalent in the lower stratum —below one mile. Any region regardless of the thickness of the stratum of air may be divided into two parts in a discussion of bumpiness. One part is that close to the ground and the remainder constitutes the other part.

There is nothing mysterious about bumps in the air. Some are stationary, but generally they are moving more or less like waves, eddies and convection currents in a turbulent stream of water.

The jar felt in an airplane results from a more or less sudden deflection due to the inertia and momentum of air which is moving in a direction differing from that of the general current. The magnitude of the jar or bump depends not only upon the abruptness of change in the direction of the air-current but also upon the velocity of the deflected air and upon the velocity and total weight of the airplane and its load.

A light canoe moving along slowly over turbulent water is tossed about by the forces of the deflected water which would make little or no impression upon a heavy boat. If the turbulence is not too great the bumpiness becomes less and less noticeable as the speed of the canoe is increased. Thus, it is seen that bumpiness depends upon the vehicle and its characteristics as well as upon the medium and its characteristics.

The relatively great spread of the wings of airplanes gives the air-currents a correspondingly great leverage so that the abrupt sideways tilt is commonly noticeable in bumpy air. If the airplane strikes a deflecting current squarely, the movement of the craft is upward or downward. To the uninitiated these are usually "terrific" bumps.

But are they?

Certainly a jar is felt only because the human body has been suddenly moved in another direction. Comparable jars in an automobile or in an airplane are due to comparable movements or changes in the direction in which the human body was moving. A sudden displacement of an inch is a real jar in an automobile. An equal jar is produced in an airplane by a sudden displacement of the same magnitude. Therefore, when bumping the bumps in flying the passenger or novice pilot did not "drop ten feet" suddenly.

Of course, moderately sudden drops of many feet are possible in flying but so are they in automobiling. The point is that causes of similar jars are no different in the air than on the ground.

Before considering the many forms and locations of bumpiness in the aerial world let us confine ourselves to that really dangerous layer at the earth's surface. The topography of this surface, including trees, hills and artificial structures, is fixed but bumpiness can arise from two causes. When there is no wind there can be a difference in the absorption of heat from the sun which gives rise to upward (convection) currents of air of various velocities. The difference in these velocities depends upon the difference in the temperature of the various surfaces and upon the intensity of the solar radiation.

Other conditions being equal bumpiness is less at night than in the daytime.

Furthermore, where there is no wind this kind of bumpiness practically disappears when the various surfaces become cooled to the same temperature.

When a wind is blowing every stationary object deflects the course of the air-current just as partially submerged rocks do to the water in a trout-stream. Besides these deflections there are eddies and general turbulence. Much of the force or energy of winds is expended by such deflections and air-movement near the earth's surface and is generally slower than at some distance above it on account of this "friction."

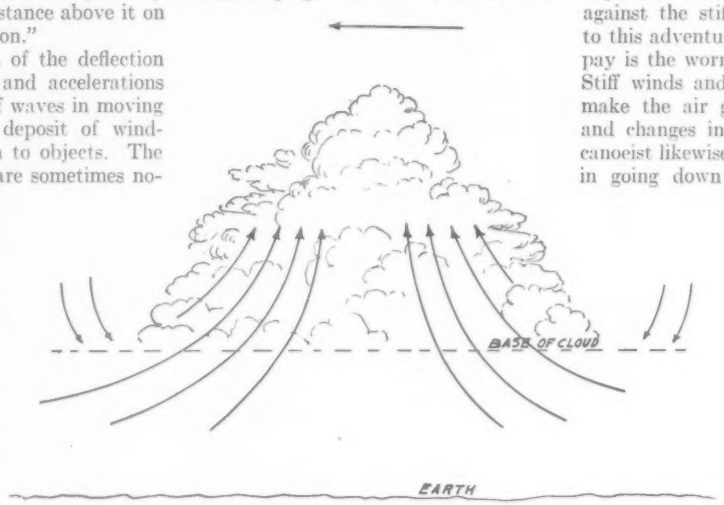
One gains some idea of the deflection of winds—slowing up and accelerations—of eddies and even of waves in moving air by observing the deposit of wind-driven snow in relation to objects. The effects of obstructions are sometimes noticed for hundreds of feet to the leeward of objects.

The effect of turbulence due to the earth's topography and to artificial obstructions can be measured exactly. Commonly the accelerations in the horizontal component of ordinary prevailing winds are only about one-twentieth as much as are necessary to sustain an airplane in soaring flight. However, sometimes this fraction is much greater. Naturally an aircraft flying against the wind tends to drop momentarily when the wind speed suddenly decreases. Conversely it tends to rise when the wind increases. Changes in the atmospheric pressure and in the density of the jar play no appreciable part in bumpiness.

Naturally there are changes in the vertical component of the wind along with horizontal changes. Also there are vertically deflected currents due to obstacles. If these are of appreciable magnitude they operate to push the craft upward or downward. In landing over hangars, an upward current due to a deflected strong wind is sometimes noticeable. However, from the data available and from general experience it seems certain that too much importance is attached to vertical motion of deflected currents. The acceleration and slowing up of the horizontal component is of relatively greater importance than usually considered. Of course, the effectiveness of a vertical gust is greater than that of a horizontal change of the same magnitude and speed when a craft is flying horizontally.

The height to which a vertical gust extends depends upon the velocity of the wind and the height and width of the obstruction. Usually the disturbance should not be detectable at altitudes more than two or three times the height of the deflecting object. Perhaps seldom is the disturbance more than four times the height of the object above the level of the ground.

One can study these deflected currents by observing dust, feathers and various light objects carried along in the air. Of course, a toy balloon helps particularly if its buoyancy is just right as obtained by a mixture of hydrogen or "illuminating" gas and air. Such observations reveal the effect of vertical gusts due to ordinary obstructions extending up to 100 or 200 feet when the wind is brisk.



Air currents in a cumulus cloud.

Suppose a hill extends 1,000 feet above the surrounding plain and a stiff wind is blowing. The air is deflected upward to about 1,000 feet. In very high winds the disturbance is likely to extend to an altitude of 3,000 feet. Let us follow an imaginary light object in a stiff wind. It soars slantingly upward until it reaches a height of 1,000 feet or more. By this time it has traveled a horizontal distance of perhaps 2,000 feet. It gradually drops lower until it apparently is going to land a mile away from the hill. However, it is likely to be caught by an eddy as it falls below the level of the crest of the hill and may return to a point much closer to the hill before it actually strikes the earth.

Perhaps the reader has noticed a cloud over a high mountain-top just to the leeward of the crest. It seems to remain there stationary like a misty flag attached to the crest. This is evidence of a decreased air-pressure due to the partial vacuum caused by the stiff wind blowing over the mountain-top and deflected upward and around it.

Owing to this decreased pressure and consequent reduction in temperature, the air cannot retain all its water-vapor; therefore, some of it condenses and a cloud forms. Actually the cloud is constantly floating away at the leeward end and is constantly being formed at the windward end. The result is an apparently stationary cloud. This phenomenon is just one of the results of this deflection of air. Here as in all cases clouds have a message to the aerial traveler or observer who is cloud-wise.

Perhaps the novice may be tempted to take his first solo flight on a windy day. A relatively slower landing-speed against the stiff wind may attract him to this adventure. But one price he will pay is the worries of greater bumpiness. Stiff winds and topography conspire to make the air gusty—full of deflections and changes in velocity. The amateur canoeist likewise need not paddle as hard in going down a swift stream but he too pays the price of greater alertness and annoyance on account of the turbulence of the stiff current.

Now let us consider the bumpiness due to unequal heating and cooling of the various areas of the earth's surface. A dry sandy beach gets hotter on a sunny day than the adjacent water or woods. This hot strip of beach heats the air in contact with it. This heated air expands and now being of lighter density than the surrounding air it rises because it is displaced by the heavier air which is pulled downward by the earth's force of gravitation.

This lighter air may be likened to a cork held under water. When it is released it is crowded upward by the heavier water which sinks downward. The submerged cork rises rapidly because of the great difference in densities of cork and of water. Similarly the hotter the air over the sandy beach becomes the more rapidly it rises.

An airplane crossing this strip from the water or the woods will receive a jar. This is a common bump and it can be of severe proportions. The same result would be experienced if the airplane passed over a tall smoke-stack. Here the heated air from the boilers is rising in the chimney. Its rate of rise increases as the height of the chimney increases because of the increase in the difference between the pressure of air outside and inside the chimney at the level of the ground. If it were important to study bumps and to get used to them the factory chimneys provide artificial bumps which can readily be measured and studied.

Certainly the cauliflower crests of ordinary cumulus clouds and particularly

of the towering thunderheads reveal bumpiness in that vertically turbulent air. On passing over any of these clouds or through them an airplane will be jarred to various degrees. Even directly below them where the rising air has not yet cooled sufficiently for clouds to form, the air is rising. In fact, on quiet days or when the breeze is gentle one might explore the invisible vertical column of air from the ground to the cumulus cloud a mile above. A bump should be experienced every time this rising column is entered. In fact, on such days there are numerous invisible chimneys, each a mile high, extending upward from the earth's surface.

Water and woods do not heat up as much as sandy areas. Plowed ground becomes hotter than a wheat field. Growing vegetation provides areas which usually remain cooler than dry barren areas. Grazing land should get hotter than a growing corn field. Everywhere on the earth's surface areas differ in their absorption of solar radiation and in their heating effect upon the air in contact with them. Therefore, it is not surprising that the air can be very bumpy in certain localities on hot summer days even when there is no wind or even a breeze.

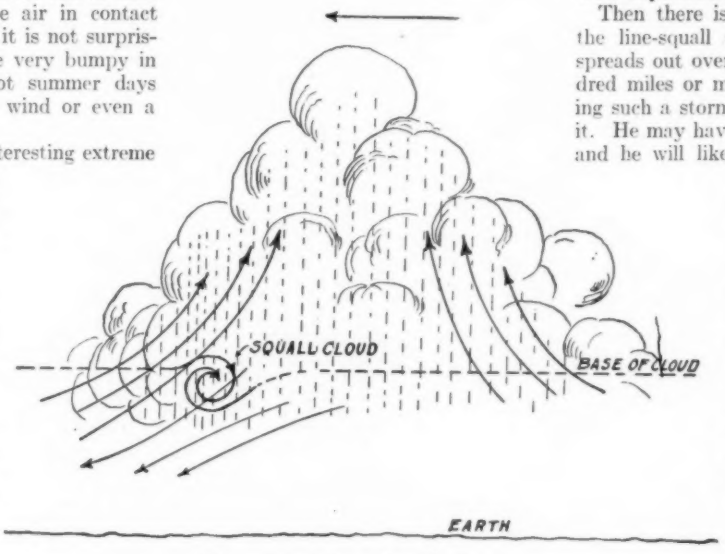
Let us consider an interesting extreme case—that of a great expanse of barren parched desert. Here there is little cloudiness and intense sunshine which favors bumpiness. On the other hand, the area is more or less uniform as to materials of the surface. Barren rock, dry sand and hard earth have more or less equal ability to absorb solar radiation and to heat up. Why, then, in the absence of great diversity of surface character should the air be bumpy over such an area? The answer is, that the effect of the absence of widely diverse areas such as woods, fields, water and plowed ground is more than made up for by the violence of up-drafts due to intense heating.

A good analogy is a horizontal sheet of metal under which many gas flames are burning. The hottest air *must* rise and the air close to the surface of a desert becomes very hot. Of course, it does become hotter in some places than others, owing to the differences in conductivity of the various materials, and as a consequence this air rises. However, the large sheet of metal is a miniature model of the turbulence of air over a great expanse of desert.

The opposite case is a large expanse of water. The solar radiation is almost entirely absorbed by the water but the body of water does not become as hot as a barren desert of sand and rock. Some of the heat disappears in evaporating water from the surface. Most of the remainder raises the temperature of the surface layer of water. This warmer water is mixed by waves and convection currents so that the body of water as a whole remains much cooler than the barren desert. As a consequence the bumpiness over large expanses of water is less than over desert or even diverse areas of productive land.

Of course, bumpiness near the surface due to uneven topography and artificial obstructions is absent over oceans and great lakes. However, it can be bumpy over water due to mixed air currents and slightly due to rising air.

In hilly country, in mountains, and even in deep valleys all factors combine to produce bumpiness at times. Air may be deflected and eddied by mountains.



Air currents in a thunderstorm.

It will be cooler at the crest and on shaded areas. It will be hotter over barren rocks in the sun and less hot over sunny wooded areas. Cool air will flow down the slopes from the crest or from the woods. Any of many conditions may be found here and there so that such regions are naturally bumpy.

A third type of bumpiness is not as general as those due to topography and to unequal heating of the earth's surface but it is more serious. This is the bumpiness on the borderline between two great air-currents or between two widely different conditions. Where two air-currents meet or slide by each other there is bound to be more or less turbulence. When clouds are not present this condition usually finds the air-traveler unsuspecting. Current weather data might in some cases forewarn the flyer but in the present state of the art of weather prediction and recording one might expect to run into such turbulence without warning.

Fortunately clouds are often present along this turbulent border. Either they are made by the cooling due to the disorder caused by the mixing currents or one of the two conditions which cause such a turbulence may actually be a storm. Then, of course, clouds are present. For example, it is obvious to any thoughtful observer that along the rolling squall-cloud which precedes the ordinary thunderstorm is a violently disturbed region. Perhaps someone with foolhardy daring or a thirst for a thrill has intentionally flown into or along this borderline between the squall-cloud and the relatively quiet air ahead of it. Perhaps some flyers have skirted such a region in order to reach the protection of the home hangar. In any case thrills were experienced.

Then there is what might be termed the line-squall or thunderstorm which spreads out over a wide front of a hundred miles or more. A flyer approaching such a storm may decide to go over it. He may have to climb to 15,000 feet and he will likely experience plenty of bumpiness. Unless he must get along his course he would be using better judgment to land or to turn tail. No aircraft capable of cross-country flight is too slow to out-distance such a storm.

Early one morning before daylight the author was awakened by a violent squally thunderstorm. He was living in the southwest apartment on the ninth floor. Wind and rain and thunder and lightning raged. His experience assured him that this storm—which blew and thundered past in a short time—was a line-squall. To the south a hundred miles was a great rigid airship on its way across the country—the Shenandoah. His thoughts turned to it and he wondered if this storm extended far enough to cross its course. At breakfast the papers announced the disaster. There was an inquiry and so forth, but two questions were not clearly answered. Was the Commander ordered to reach his destination regardless of weather? Was he at liberty to disregard his destination if necessary to safeguard his crew and his craft?

The fact is that a huge rigid craft hundreds of feet long, constructed of

(Continued on page 90)

Another Conquest of the Atlantic

With their fuel exhausted from struggling with storms, and the added weight of a stow-away, Jean Assolant, Rene Lefevre and Armeno Lotti landed on the beach near Santander, Spain, on June 14, thirty hours after leaving Old Orchard, Maine, in their Hispano-Suize powered Bernard monoplane—the "Yellow Bird."

Mme. Jean Assolant, the former Pauline Parker, who married the flyer just before the hop-off.

From left to right: M. Lefevre, M. Lotti and M. Assolant

The "Yellow Bird" just off the sands at Old Orchard, Maine, where the flight had its official start.

Major V. Casajus, flyer and Military Attaché to the Spanish Embassy.

24-Hour Trips Across the Atlantic

By J. Herbert Duckworth

"AERIALLY speaking, the United States is today no farther from Europe or Asia than England was from Germany in 1918."

"Bombing planes, now it has been shown that they can be fed gasoline in the air and be kept aloft for days, will make cities far more dangerous than the front line trenches in the next war. The safest place will be with the armies in the field, right up on the firing line."

"The refueling demonstration of the Question Mark has reduced the promise of a regular twenty-four-hour airplane service across the Atlantic from the category of dreams to the realities."

These are some of the opinions, expressed in an interview with a representative of AERONAUTICS, by Major V. Casajus, flyer and Military Attaché to the Spanish Embassy at Washington.

Major Casajus was an official observer, in his diplomatic capacity, with the squadron of nine American army bombers that made the coast-to-coast trip. One of his missions in recent months has been to interest the people of the United States in a plan to establish a Spanish-American transatlantic air service between Spain and this country.

The Spanish project, which has the enthusiastic support of King Alphonso, proposes the building of refueling stations at Bermuda and the Azores for the eastward trip and the Madeiras and Porto Rico for the westbound journey, the airport on this side to be somewhere in Florida and that in Europe at Seville. By taking the southern route the aircraft would avoid the fogs and storms of the North Atlantic.

"The successful experiment of refilling the gasoline tanks of an airplane in flight and keeping it aloft for nearly a week is of tremendous military significance," said Major Casajus. "The lesson should be taken to heart by civilians who in the next war will be the chief sufferers from bombs and poison gas dropped from the sky.

"No country in the world, and no part of any country, is so situated that it can any longer regard itself as being secure from aerial bombardment because of its isolation. No city in the United States, however far it may be from the Atlantic or Pacific seaboards, is now beyond the range of enemy planes.

"On the outbreak of the next war, if ever there should be one, fleets of fast bombing planes will be dispatched at once to the centers of population of the enemy in order to break the morale of civilians. Civilians, remember, pay the bills of Mars, and can call off a conflict if they really have the mind to do so.

"Oceans and mountain ranges are no longer insuperable barriers to modern bombers. Bombers can take off with a maximum load of bombs and a minimum supply of gasoline and be refueled by

(Continued on page 88)

Society in the Air

By Betty Huyler

"MR. REGINALD DE V. HAY started a new fad amongst the smart North Shore set last week when he took several of his friends for a moonlight flight over New York City and Long Island Sound in his amphibian 'Racketeer.'"

—Town Topics.

We will soon be reading items such as the above, in Town Topics and its contemporaries.

The possibilities of the airplane for the sportsman are unlimited and the smart people have taken to flying with a vengeance. And how the members of the fair sex are jumping at the opportunity to get ahead of their lesser halves! While friend husband is busy in his office, friend wife can be found at the field taking lessons or getting in her solo time. For this is one game that can be played by both sexes and it has come into its own right in the midst of the period when equality of sexes is an issue.

"High Flying" activities will probably be concentrated around the Aviation County Clubs. Units are being formed in all the large cities of this country. The Long Island Club has a field and two hangars completed, and a club house well under way. One can picture the verandas of these club houses on a Sunday afternoon with wagers being made as to whether Miss Van Near who is on her first solo flight, will land the first time she tries, whether Brook or Black can land nearest a spot, and whether a Stearman or a Laird is the faster.

The writer recently flew down to Atlanta with B. Allison Gillies, one of the most ardent week-end users of a plane, who was going down to meet Lt. E. G. Taylor, U.S.M.C., with whom he had served on the U. S. S. Lexington. Lt. Taylor flew up to Atlanta from Pensacola, Florida, where he is now stationed. This just shows the possibilities of keeping up contacts with far away friends by using a plane to shorten the distances.

On the trip between Richmond, and Spartanburg, we flew over Amelia, Va., and Grover, N. C., and couldn't help but think that it was a strange coincidence that two such prominent aviation names should be found directly on one of our air mail routes. As is well known, Miss Amelia Earhart uses and flies her own plane in most of her traveling. Mr. Grover Loening, who is most prominent not only in aeronautical circles but in New York social circles as well, also flies his own planes—he has a DH Moth and a Curtiss Robin—and recently made a free fall parachute jump just for the thrill of it. And, of course, he uses the amphibians which bear his name. He sold the company that makes them some time ago and it is now a division of Keystone Aircraft Corporation but he is consulted by the Keystone people frequently as he probably knows more about amphibians than anyone else in this country.

Mr. Loening tells an interesting story of a forced landing he made in a cow pasture in Virginia last month. The pasture was inhabited by some high bred long horned Jersey cows who with one accord pricked up their horns and started on an expedition of investigation. Not even the entreating voice of Mr. Loening saying, "Whoa, bossie, go back, bossie," could stay the advance, so the farm hands enjoyed the sight of a dignified sportsman-flyer breaking the hundred yard dash record to reach the other side of the fence before the horns reached him. Newport, R. I., has been the objective of many of Mr. Loening's cross country flights. He used an amphibian last year and landed at Bailey's Beach but this year he is reported to have shown great interest in the landing field.

Among the fair pilots we find Miss Eleanor Hoyt, daughter of Mr. R. F. Hoyt, who is chairman of the Board of Directors of the Keystone Aircraft Corporation. Miss Hoyt flies her father's Loening Amphibian and has a DH Moth of her own for sport use.

Mrs. James Simpson, Jr., formerly Miss Alicia Patterson, has two Laird Planes which she uses for sport flying and also for trips. She has been flying since last October and is aiming for a Transport Pilot's license.

Mrs. James Simpson, Jr.

Mrs. George Kunz, charming wife of Dr. George F. Kunz of Tiffany & Company, has received her pilot's license from the Department of Commerce and uses her plane for trips between New York and her summer home in Putnam County.

Messrs. R. Huntington, Peter R. L. Brooks, and Eric Wood, all of whom are prominent in New York society, have formed the Cox and Stevens Aircraft Corporation and are very active. Mr. Brooks, who flew the plane from which Mr. Loening made his parachute jump, uses his plane to get over to the Piping

Grover Loening and Muriel Vanderbilt Church.

Rock Golf Club when he has a few spare moments. He then has it handy in case he is called on for a sudden trip. Mr. Wood uses his plane for frequent trips to Wilmington, Delaware, where he visits friends.

Mr. George Kent of Jericho, Long Island, has a Stearman and a Laird racer that he keeps at Roosevelt Field. He uses them for both business and pleasure, most of his business being long cross country trips.

Roger Wolf Kahn.

Mr. Roger Wolf Kahn spends a good deal of his time in the air. He owns 2 Bellancas, a Fleet, and a Vought Corsair, all of which are kept down at Roosevelt Field, Long Island. Mr. Kahn is one of the many young men who fly just for the thrill and pleasure involved.

Flying to horse races will undoubtedly become increasingly popular with the followers of the track. Mr. John Hay Whitney and his mother flew down to Baltimore last month to see the Preakness run at Pimlico. Mr. George Pynchon, Jr., flew his Curtiss Robin to Louisville for the Kentucky Derby. Mr. Whitney used his Sikorsky Amphibian "Pegasus" last winter when he made a trip to California to play in the polo matches.

Most any afternoon one can see Mr. Pynchon leaving Roosevelt Field with a couple of his friends for some golf or a visit on some estate. Mr. Pynchon is active in aviation financial affairs and is a member of the Executive Committee of Roosevelt Field, Inc.

An interesting week-end trip combining pleasure and business was made recently when Miss Amelia Earhart, Mr. Grover Loening and Mr. B. Allison Gillies flew down to Pimlico to see the Preakness run, spent Saturday and Sunday as guests of Mr. S. W. Labrot on Holly Beach Farm, Mr. Labrot's plantation at Annapolis, and then went down to Langley Field for a conference at the National Advisory Committee for Aeronautics laboratory. While at Holly Beach Farm, Mr. and Mrs. Labrot and all the guests, including the charming Miss Adele Reynal, Mr. and Mrs. LaFargé, and Mr. W. H. Labrot enjoyed seeing the beauties of the countryside from the air.

Architects and landscape gardeners are now faced with the problem of laying out landing fields along with golf course, tennis courts and swimming pools on all the new estates. Colonel E. A. Deeds, President of the National City Company, uses a Ford Trimotor for trips to his plantations in Cuba and has a landing field right next to his house on his estate at Dayton, Ohio. Mr. Charles L. Lawrance, President of the Wright Aeronautical Corporation, maintains a field on his estate at Islip, Long Island, for his own use and for the use of his many flying friends. Mr. John W. Gillies has a field at Stony Point, New York, which is used by his two sons, both of whom fly. DuPont Field at Wilmington, Delaware, is a private field par excellence. This field is owned and maintained by the several branches of the DuPont family and is completely equipped for both day and night flying. The DuPonts have a fleet of seven or eight planes running from a light sport plane to a five passenger cabin monoplane.

Aviation Country Clubs are contributing in a large measure to the popularity of flying among the members of the social world—or perhaps it might be turned about to read that the popularity of flying is contributing to the formation of chapters of the Aviation Country Clubs. At any rate, the Long Island Country Club, located near Hicksville, Long Island, was recently inaugurated with the assembling of some eighty honor guests and the National Board of Governors at a luncheon in the new Colonial clubhouse.

The little clubhouse is simple in design and construction, but it is a comfortable and extremely attractive building. There is an observation lounge, a dining room, showers both for men and women, locker facilities, three bedrooms for the convenience of members of the Long Island chapter or visiting members from other chapters who may wish to remain overnight, quarters for the resident manager, and service arrangements.

The Long Island Club was dedicated with considerable pomp and circumstance. After the luncheon the program of services was begun with an address by F. Trubee Davison, Assistant Secretary of War for Aeronautics. Mr. Davison spoke standing on the lawn facing the veranda, with a low hedge and the flying field at his back. A short prayer by Capt. J. J. Brady, Chaplain Corps, 3rd Naval District, U. S. N., was followed by the dedication of the club flag. Four planes owned by the club were next christened. The first, a Travel Air cabin monoplane, was christened Malola by Miss Eleanor Hoyt. A two place Curtiss Fledgling was christened School Marm by Miss Ann McDonnell. Another two place training and sport plane, a Moth, was christened Squirrel by Miss Emily Lawrance, daughter of Charles L. Lawrance, the president of the Wright Aeronautical Corporation. The fourth plane to be christened was a Whittelsey Avian with Handley-Page slotted wings. Miss Frances Reaves, daughter of John S. Reaves, Chairman of the National Organization Committee of the clubs, named this plane Bunny.

Miss Betty Huyler.

Exhibition flying was next in order. Planes from the Army Air Corps unit at Mitchel Field flew over the club aerodrome and landed; there were parachute jumps; and as a demonstration of the airmanship of the club pilots there was a spot landing competition for members only. Tea and dancing concluded the program.

So we find society utilizing to the fullest extent this new field of aviation.

The Diesel-powered Stinson-Detroiter.

And Now—the Diesel

By Edward A. Stinson

WITH all the conflicting stories relating to the development of the Diesel engine as a motive power for aircraft it might be well to give the actual facts about the one engine which has made a public appearance.

Late in the summer of 1928 the Packard Motor Car Company of Detroit purchased a six passenger Stinson-Detroiter from the Stinson Aircraft Corporation in order to make exhaustive flying tests of their new Diesel aircraft engine. The plane was a standard model, one which is ordinarily equipped with a 225-horsepower Wright J5 Whirlwind.

In accordance with instructions the plane was delivered to the Packard Motor Car Company without the engine mounting or the exhaust ring. This construction detail was left strictly to the Packard engineers since absolute secrecy surrounded their research work with the Diesel engine.

Upon satisfactory installation of the Diesel engine the entire plane was carefully checked by a Stinson service man and the first test flights were made from the Packard proving grounds near Utica, Michigan.

So that conditions might duplicate those of actual service as closely as possible, no changes were made in the plane itself. It was fitted with dual wheel control, every comfort for the six passengers was fitted, there was a baggage compartment located at the rear of the cabin with access from an interior door, and the plane was finished in a black and orange color combination.

Constructionally the plane was standard, with a seamless steel tubing fuselage. The entire plane was fabric covered and treated with six coats of dope before the final color coat was applied. The airfoil section was the M-6 curve, and wings were made of one-piece spruce spars, with spruce ribs and Warren truss reinforced compression tubes.

Mention of successful flights seldom appeared in the newsprints. Many flights were made, however, and there was a good deal of unconfirmed rumor concerning the new engine. One epochal flight was made, with a famous celebrity as a passenger. Readers will remember the visit of the Crown Prince of Spain, who is an aviation enthusiast, to the United States. While in Detroit he was the guest of Alvin MacCauley, president of the Packard Motor Car Company. It was during this visit that he made a short trip in the Diesel equipped plane, with Captain Woolson and W. E. Lees, the company's test pilot. The Crown Prince was highly enthusiastic over the performance of the plane with the new motor.

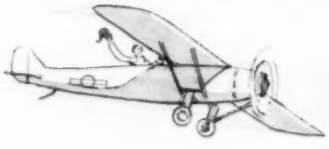
Late in the Spring of 1929 sufficient progress had been made with the Diesel engine so that a public announcement could be made safely.

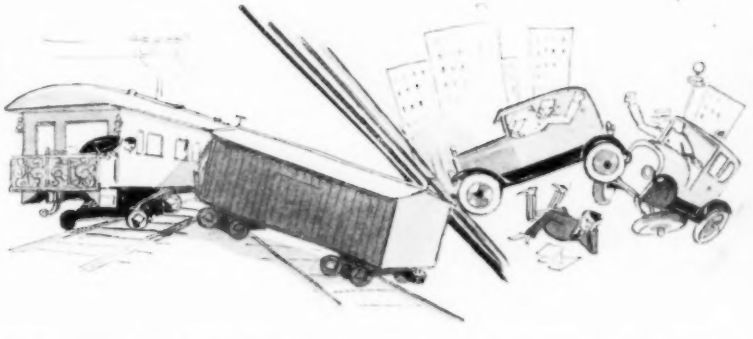
The fourth annual aeronautical conference of the National Advisory Committee for Aeronautics was to be held in Washington the week of May 12, and it was decided to announce publicly the engine at that time.

Accordingly, the Stinson-Detroiter was made ready for the flight, and early Tuesday morning, May 14, Captain

(Continued on page 66)

Picked Up in the Hangars





A Dangerous Life, This

Captain Albert W. Stevens, the army's crack aerial photographer, has climbed in his plane as high as 38,000 feet without mishap.

Recently, while descending stairs at Wright Field, the engineering base near here, he lost his footing, fell to a concrete floor and broke his right arm.

He was carrying a large aerial camera down the stairs and his attempt to save the camera when he started to fall caused him to be injured.

Except, Maybe, "First in War"

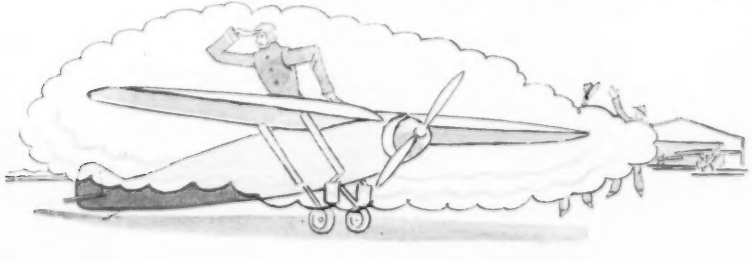
B. D. Spofford of Waco Aircraft Company sent us the following telegram the other day:

"Freddie Lund, Waco Chief Test Pilot, married today at Memphis to Betty Elkins of Los Angeles Stop Saturday Freddie tied for first place in stunting contest with Waco two twenty taper wing against navy pilot flying Wasp Hawk Stop Freddie never will be first anymore He is tied for life."

Meadow Lost on Rockwell Field

Lieut. E. L. Meadow, of the 95th Pursuit Squadron, has the distinction of losing himself on Rockwell Field, according to a recent Air Corps news letter. Immediately after landing he was shut off from the world by a thick blanket of fog. He endeavored to taxi up to the

line by watching his compass, but failed to allow for declination, and landed up on the edge of Whaler's Bight, at the southwest corner of the field. After climbing out of his ship and performing a distance reconnaissance mission on foot, he again attempted to taxi to the hangar line. This time he succeeded in reaching a Navy outpost on the Northwest shoreline. The fog was low, extending upward about 15 feet from the ground, so Lieutenant Meadow stood on top of the upper wing to get his bearings. He was not quite high enough to look over the fog, so he finally settled down to wait for it to lift. In the meantime the other pilots of the 95th Pursuit Squadron stood in line, listening to the sound of the D-12 as Meadow was cruising about. He was finally rescued by several mechanics after the fog thinned.



These Dangerous Flying Machines

Richard H. Depew, Jr., sales engineer of the Fairchild Aviation Corporation, returning to the company's plant at Farmingdale, Long Island, on his return from a flying visit to the company's regional office at Dallas, Texas, reports as follows:

"I left Farmingdale, Long Island, at ten minutes to eleven in the morning, in a Fairchild '71,' in a rain storm. In spite of bad weather all the way, I reached St. Louis, 950 miles away, before dark, having made one stop at Columbus for gasoline. The next day I flew from St. Louis to Dallas, making one stop at Tulsa for gasoline. The trip was wholly uneventful.

"From the flying field in Dallas I took a taxicab to the Fairchild office. We had proceeded only a short distance when another automobile crashed into ours, bending our axle, smashing our mudguards and breaking the spokes in our wheels. Fortunately, the only in-

(Continued on page 66)

Almost all the old-timers know her as Mrs. Waco.

Photograph by Whitt-Gregg, Toledo

What Men Flyers Think of Women Pilots

By Hattie Meyers Junkin

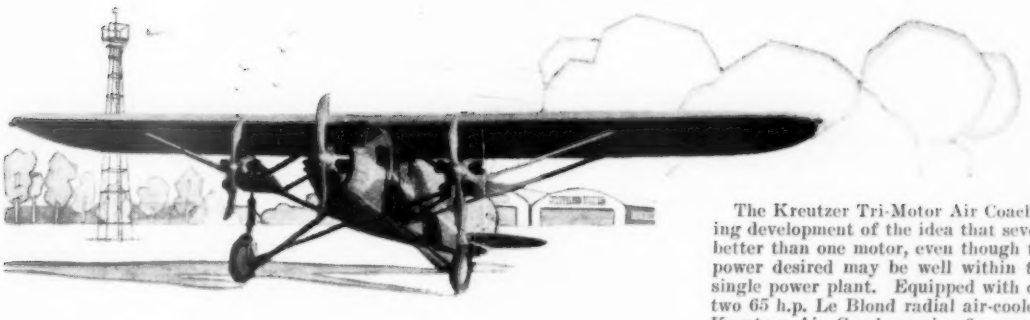
I SUPPOSE it is a fact that when anyone makes a statement on any topic and makes the statement sincerely he reveals his own personality as much as he does the extent of his information concerning the topic itself. Possibly for this reason men flyers are as a rule reluctant to allow themselves to be quoted on the topic of women pilots. They know very well that when they say anything either in favor of the participation of women in aviation or against it they expose to a certain extent their own experiences with and reactions to women not only in aviation but in every other phase of life. I have found the flying men of my acquaintance very touchy on this topic and it was only after much persuasion and reiterated assurances that I should never under any circumstances reveal their names that I succeeded in provoking a discussion of the topic above indicated. The suggestion was offered that if I contemplated using the material in an article it would be appropriate to print it under the title, Why Encourage Profanity Among Men Pilots? With this promising start the discussion began and it was soon flourishing like a green bay tree. Here is the printable part.

It should be remarked that, philosophically speaking, all generalizations are false and this well established principle holds good in the present case as well as in most others. It is obviously inexact to say that all the women in aviation are influenced by ulterior motives and are, moreover, complete washouts as pilots. In the first place, among the women who have chosen to actively take up flying, there are probably almost as many who are doing it for the thrill, romance, beauty, inspiration or what not that they can get out of it as there are men, and at that I think the proportion is greater in the case of the women than it is in the case of the superior sex. In the second place, a number of women have proved themselves to be very successful pilots.

(Continued on page 80)

XUM

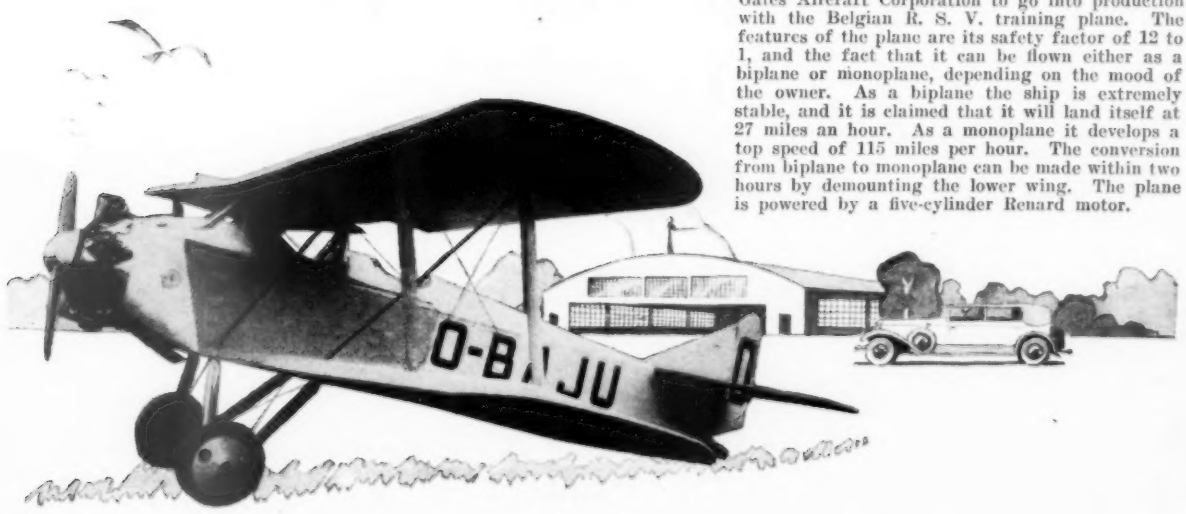
Three of the Latest



The Kreutzer Tri-Motor Air Coach is an interesting development of the idea that several motors are better than one motor, even though the total horsepower desired may be well within the range of a single power plant. Equipped with one 95 h.p. and two 65 h.p. Le Blond radial air-cooled engines, the Kreutzer Air Coach carries five passengers and a pilot, has a high speed of 115 miles per hour, cruises at 97, and lands at 40. Its service ceiling is 16,000 feet and its cruising range is 600 miles.

Model 2T-1, produced by the Great Lakes Aircraft Corporation, is intended for training and sports purposes. This model is a two-place open cockpit biplane, powered with a 95 h.p. Cirrus Mark III four-in-line air-cooled engine. The seats are especially designed to accommodate seat-pack parachutes, and have a retaining strip across the front to prevent the chutes from sliding forward. Top, cruising, and landing speeds are 115, 95, and 40 miles per hour, respectively. The ship climbs 8,000 feet in the first ten minutes and has a service ceiling of 17,150 feet.

Unusual interest attaches to the proposal of the Gates Aircraft Corporation to go into production with the Belgian R. S. V. training plane. The features of the plane are its safety factor of 12 to 1, and the fact that it can be flown either as a biplane or monoplane, depending on the mood of the owner. As a biplane the ship is extremely stable, and it is claimed that it will land itself at 27 miles an hour. As a monoplane it develops a top speed of 115 miles per hour. The conversion from biplane to monoplane can be made within two hours by demounting the lower wing. The plane is powered by a five-cylinder Renard motor.



The Month's Books—

SKY LARKING, by Bruce Gould, is a kind of Apologia Pro Aeronautica. The author undertakes to present the cause of aviation not from the point of view of the prefessional flyer or technician, nor yet as an historian or biographer. He writes of flying simply as a glorious human opportunity now available to anyone blessed with the desire to fly. Mr. Gould's own experience with aviation began with a fourteen-year-old admiration for a barnstorming pilot and his wares at an Iowa fair. Since that time Mr. Gould has been more or less actively in touch with flying affairs, first as a member of the naval aviation service during the war, and more recently, as aviation editor of the New York Evening Post.

Because of Mr. Gould's position as a literary man generally, and as a reporter of flying in particular, it is hard to forgive some of the sins both of commission and omission which have been allowed to mar his book. The book as a whole is carelessly put together, and in places it is inexact as to facts. Mr. Gould makes the statement, for example (p. 70), in a chapter devoted to a summarization of the more important events which have occurred in the world of aeronautics since Orville Wright's first flight, that "Nothing occurred in 1928 to match the spectacular flights of 1927, although Captain George H. Wilkins' dash over the Arctic Sea from Point Barrow to Spitzbergen, April 20, and the non-stop hop of Captains Del Prete and Ferrarin from Europe to South America, 4,466 miles, July 3-4, were outstanding feats." The author then goes on to mention the flights of the Bremen and of the Friendship, and speaks of the breaking of the American Transcontinental record. Mr. Gould seems to have overlooked the flight of the Southern Cross (May 31-June 9, 1928) across the Pacific from California to Australia. This flight, which is unquestionably one of the most extraordinary achievements in all the history of flying, does not seem to have roused at any time the enthusiasm which is its due. This fact makes its omission from Mr. Gould's list of star flights the more remarkable, inasmuch as he devotes a chapter apiece (and very rightly, too) to a crusade for belated recognition of the merits of the flights of the NC-4, of Alcock and Brown across the North Atlantic in the first non-stop venture, and of the Army round-the-world team.

Except for this tendency toward a distortion of values, Mr. Gould has handled his subject and his material for the most part expertly, and at times brilliantly. The book draws attention to the spiritual values of aviation—meaning the beauty and the challenge of flight—in a powerful and stimulating way. Sky Larking is, in effect, a series of essays, rather loosely knit together, concerning the joys and possibilities in flying, and the last four or five of the essays, on military, commercial and sport flying, and on troubadours of the air, may stand permanently as an authentic interpretation of what flying meant to the first generation of flyers.

LEARNING TO FLY, by Frank A. Swoffer, Chief Instructor to the Hampshire Aeroplane Club, and late Instructor at the Central Flying School, Royal Air Force, Upavon, is another flight manual intended to serve as a sort of preliminary and supplementary lecture course between the instructor and the pupil.

Mr. Swoffer writes as a practical instructor and manages to convey something of the spirit which prevails in actual primary instruction as carried out aloft. Instead of explaining in a few clear, but often totally misleading sentences the manipulation of the controls for turns and spirals, and letting it go at that, Mr. Swoffer describes what happens to the student flyer himself during these maneuvers. It is actually more important to correct a student's misconception of piloting than to concentrate on mere mechanical description. In this Mr. Swoffer is exceptionally successful.

The book is sharp, exact and stimulating. It achieves its purpose and at the same time succeeds in not being dull or fatuous. The author indulges a very healthy sense of humor, and the book is good reading. The following is a fair example of Mr. Swoffer's style:

"Pulling the Control Column Back When the Wheels Touch the Ground: In this case the aeroplane touches the ground prematurely, and as soon as the pupil feels the wheels touch, he pulls the control column back hard. I suppose, having been told that it should be right back when landing, he intends having that part of the landing right, and so back it comes. The result is, of course, that the aeroplane leaves the ground at once, with the nose well up. The instructor opens the throttle immediately, and hopes that that nasty splutter of the engine that so often occurs at such a critical moment will not take place on this occasion. If only pupils knew what their instructor goes through at these times, and what might go through the instructor!!!"

SEVERAL other books of interest have been received this month. Simple Aerodynamics and the Airplane, by Charles N. Monteith (Ronald Press, $4.50) prepared originally in 1924 as prescribed reading in the preliminary course on Aeronautics at West Point, has stood ever since as a standard text on the mechanics of flight. The book has already been revised once, and the present volume, which constitutes the third edition and second revision, is a clean-cut, exact, authoritative and entirely up-to-date statement of the principles of aeronautical engineering. It should, and no doubt will, continue to hold its place as one of the publications of genuine distinction in its field.

A BOOK somewhat more limited as to intent and advanced as to subject matter is Airplane Structures, by Alfred S. Niles and Joseph S. Newell, published at New York by John Wiley and Sons, Inc. This volume is, in the words of the authors, ". . . prepared with a twofold purpose. In order to meet the needs of instructors giving courses in airplane structures it emphasizes and describes the application of the fundamental principles of structural theory to practical airplane design. At the same time considerable data on allowable stresses in various materials and allowable loads on standardized airplane parts are included so that it may satisfy the ordinary requirements of the practicing engineer."

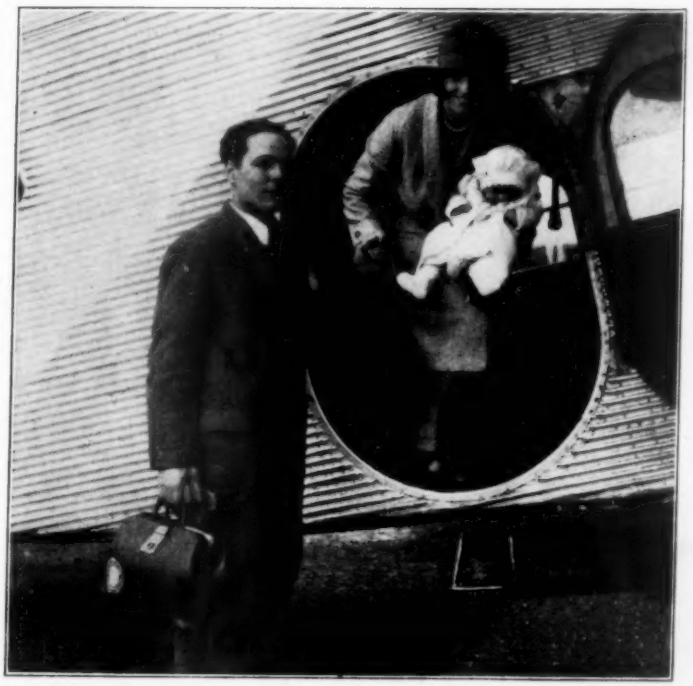
XUM

In the Flood-Light

Ross Jackson and Charles Bennett, who rode safely through Kansas' worst storm in a Swallow T. P., landing it in perfect condition while a 100-mile wind was tearing away hangars and grounded planes.

It's very hard to keep track of the constantly shifting records of the women flyers, especially since there seems to be a friendly competition going on all the time—but as we started to say, this is Marvel Crosson who made 24,000 feet at Los Angeles.

Flying his gold and black Laird at an average speed of more than 157 miles per hour, Charles W. "Speed" Holman, of St. Paul, handily won first place in the Gardner Annual Trophy Race on Memorial Day at St. Louis.



Harlan A. "Bud" Gurney, assistant operations manager of Universal Aviation Corporation, who scored a national scoop for the Chicago Tribune by being the only pilot to get out of Louisville after the Derby and deliver photographs of the race.

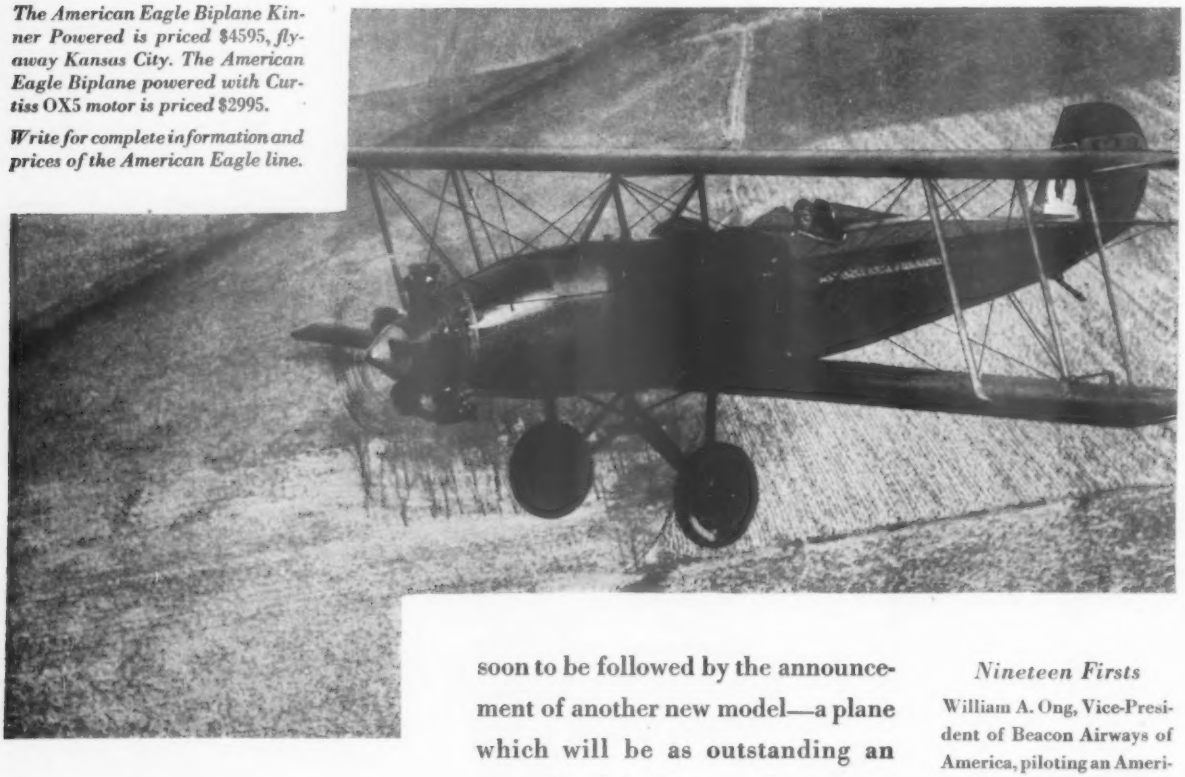
MASTER OF THE SKIES

Most popular of all new production type biplanes:

The AMERICAN EAGLE *Kinner Powered*

The American Eagle Biplane Kinner Powered is priced $4595, flyaway Kansas City. The American Eagle Biplane powered with Curtiss OX5 motor is priced $2995.

Write for complete information and prices of the American Eagle line.



TWELVE and seven-tenths percent of all new production type biplanes now in use are American Eagles!

These statistics speak for themselves. They prove that American Eagle has established itself more firmly than ever as one of the most popular planes in the commercial field.

And the future holds even greater prospects! This wonderful success is soon to be followed by the announcement of another new model—a plane which will be as outstanding an example of its type as the Kinner Powered Biplane.

American Eagle's nation-wide sales organization is now being reinforced. Valuable territories are waiting to be claimed by well-qualified dealers. These men will receive the benefits of the fairest sales franchise in the industry.

We are eager to tell you the facts. Write to us today!

Nineteen Firsts

William A. Ong, Vice-President of Beacon Airways of America, piloting an American Eagle biplane, Kinner powered, won nineteen firsts in the recent All-Kansas Air Tour. He also won six closed course speed events with the Eagle, his fastest time over the twenty mile course being 13 minutes, 7 seconds.

These are further instances of the performance ability of this ship, which has been creating such favorable comment since its recent introduction.

AMERICAN EAGLE AIRCRAFT CORP. FAIRFAX AIRPORT KANSAS CITY · KANSAS

Air to Compete with Railways?

Large Scale Operations of 18-Passenger Planes

By Archibald Black[1] and George F. Wheeler[2]

IN the previous articles of this series, we considered the cost of operating 5-passenger and 10-passenger airplanes carrying the volume of traffic up to 80 passengers each way daily. In comparison with other means of transport, such as motor busses, steamships or railroads, this volume of traffic is comparatively insignificant. Hence in the present article we shall consider operation of 18-passenger 1500 horsepower airplanes over the same route. Actually we might carry our study up to airplanes of much greater capacity. However, as we have previously stated, it seems particularly desirable that we confine this study to sizes and types of airplanes already in existence or comparable with those which are in existence. This enables us to entirely eliminate assumptions regarding cost of airplanes, gasoline consumption and similar important factors and makes it possible to use manufacturers' actual quotations, known gasoline consumption, etc. The chief value of confining these studies to sizes of aircraft which are already in existence lies in the removal of all grounds for charges of being visionary or theoretical.

Larger Airplanes Would Show Further Savings

As a matter of fact, it would be a simple matter to carry our calculations up to include ships of 30-passenger capacity. This larger size of airplane is most intriguing for we can already see that it offers promise of still further reduction in unit cost and it is but little, if any, larger than some previously built for military or naval purposes. Actually, we could estimate the cost of operation of the 30-passenger ship with a high degree of accuracy. In fact, the only really questionable figure would be the manufacturer's price for an airplane of this size. However, unfortunately, this is one of the important factors as it influences depreciation, insurance, allowance for crashes, and other important elements in the cost of operation. Hence, rather than base these charges upon an assumed airplane cost, we have chosen to leave the larger airplane out of consideration for the present. This final estimate of the series will therefore be based upon operation of 18-passenger 1500 horsepower tri-motor airplanes between New York and Cleveland.

Operation Studies

All of the other conditions are similar to those assumed in the two previous estimates including the scheduled speed of 100 miles per hour, operations scheduled for 7 days per week and no intermediate stop en route excepting when necessitated by weather. The total scheduled operations are shown on page 37.

As in previous estimates 10 percent has been deducted from scheduled performance to allow for weather interference, although as previously stated this tends to err on the conservative side. Table 6, page 37, thus gives the net revenue operations on these bases.

To allow for ferrying and other unpaid flying, as in previous estimates, 10% is added, making the total operations for cost estimate purposes as in Table 6.

Overhauls, Investment and Cost of Operation

It now becomes necessary to determine the number of airplane and engine overhauls per year and, using the same basis of 1000 hours for airplanes, 250 hours for engines, as in the previous estimates, we have assembled the data in Table 6.

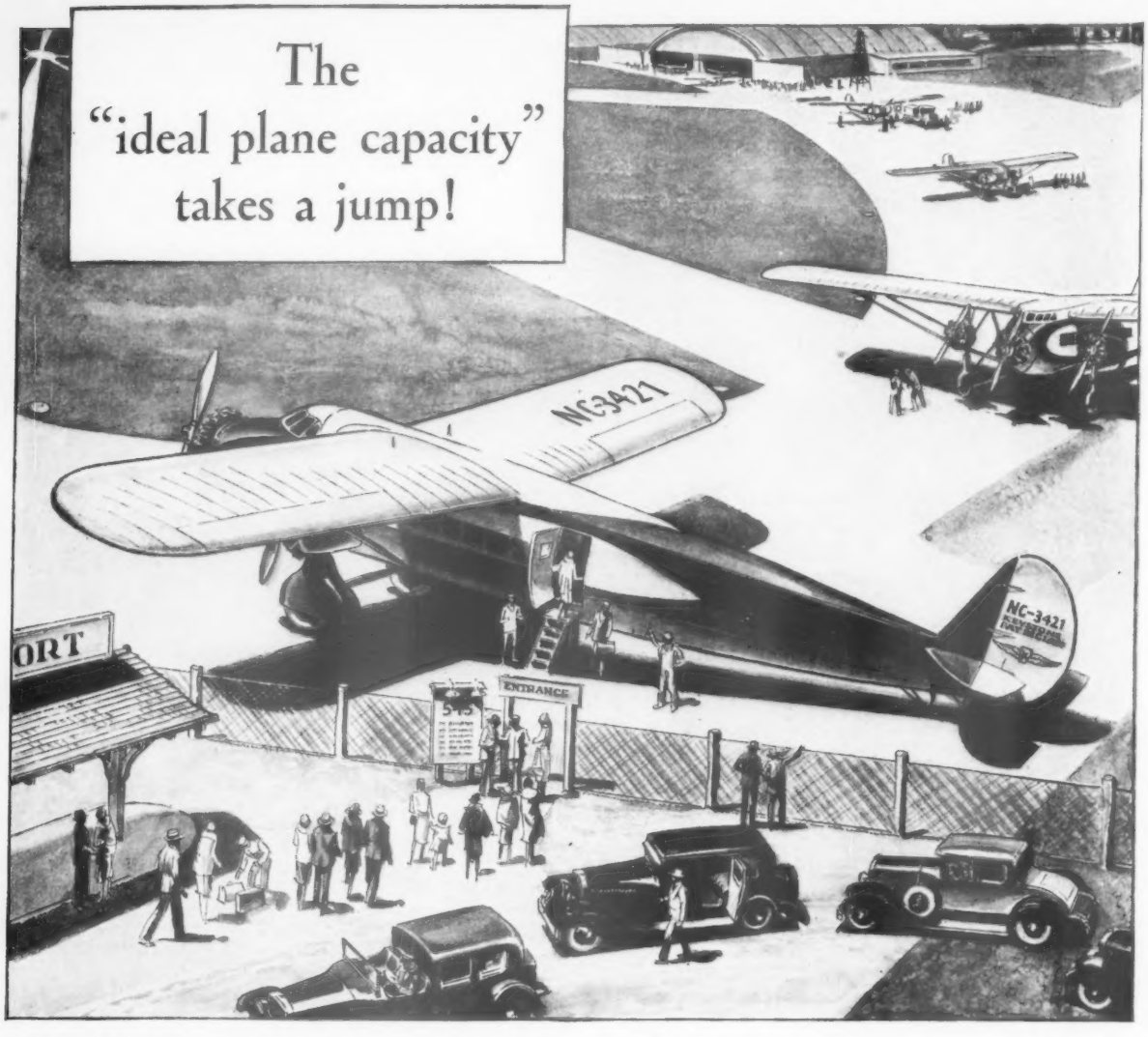
The questions of assignment of equipment and personnel were considered in the two previous articles and (although they had to be considered again for the present estimates) we shall eliminate the burden of detail here and merely present the results in the accompanying tables. As before, it has been assumed that existing airports and hangars are used and no allowance is made for their construction in the estimate of investment required. Table 7 gives the result of these estimates of capital investment and shows the same characteristic advantage of the large scale operations as found in the previous estimates. In Table 8 are given the estimates of operating cost compiled in a similar manner to that used in the previous articles.

Passenger Mile Rate Drops

The really interesting compilation of this whole study is presented in Table 9 of unit costs for this largest size of airplanes. Here it will be noted the cost per passenger mile has dropped to 11 cents even if only one round trip daily

[1] Air Transport Engineer; President, Black & Bigelow, Inc.; author of "Transport Aviation" and "Civil Airports and Airways."

[2] Industrial Investigations Division, Black & Bigelow, Inc.



ACCORDING to current news reports, applications for passage on the initial trips of an important transport line far exceed the accommodations available. This growing demand for air travel will be further stimulated, authorities agree, by the development of larger airplanes so that passenger rates may be reduced.

The most advanced accomplishment in this direction is the PATRICIAN, Keystone's new, efficient air liner. Substitute this latest tri-motor for present equipment on the majority of lines and a reduction in expenditures of from 20% to 35% is at once effected. Considerably lower passenger fares *without loss of profit* are then made feasible, resulting in increased patronage.

Fifteen or twenty passengers are transported from port to port by the PATRICIAN at a speed that challenges the best efforts of most racing planes. And with new safety, too, for the PATRICIAN has great reserve power and is remarkable for its exceptional ruggedness. For these reasons, and because of its smoothness of flight, its capacious luxury, airwise travelers choose to go "via PATRICIAN". Indeed, the future of air transportation is dependent upon the very qualities in which the PATRICIAN today excels.

An analysis showing possible savings for present or projected airlines will be gladly prepared on request.

KEYSTONE

"THE KEYSTONE OF SAFE FLYING"

KEYSTONE AIRCRAFT CORPORATION
SALES OFFICES: 31st STREET & EAST RIVER, NEW YORK
PLANTS: BRISTOL, PENNA. AND NEW YORK CITY

Distributors: NEW YORK, Cox & Stevens Aviation Corp.; BOSTON, East Coast Aircraft Sales Corp.; PHILADELPHIA, Ludington Philadelphia Flying Service; CLEVELAND-DETROIT, Thompson Aeronautical Corp.; PITTSBURGH, Pittsburgh Aircraft Agency Corp.; LOS ANGELES, W. E. Thomas; SEATTLE, Gorst Air Transport, Inc.; *SHANGHAI*, Andersen-Meyer & Co.; *SOUTH AMERICA*, B. Nicoll & Co., New York.

is flown. As operations increase the unit costs continue to fall until, with 8 round trips daily the cost per passenger mile is just over 7 cents! And this is without allowance for the further reductions possible through reduction prices on these large airplanes, better quotations on gasoline and other such savings following such an important scale of operations. On the 8-trip basis, it might be noted the traffic capacity is still only 144 passengers each way daily. This is such a small volume of traffic,—from the transportation viewpoint,—that it barely scratches the surface. And yet what a realm of possibility it opens!

Startling Comparisons with Rail Travel

Comparison with existing railroad fares shows conditions to be much more favorable to the airline than first impression suggests. This is due to the circuitous course of the railroads plus the extra fare and Pullman charges. Actually the airline fare would be only $28.05 if the 7.1 cent rate can be maintained. This compares with the total rail fare of $27.38 including fare, extra fare and Pullman berth. The time comparison is startling. *4 hours by air as against 14 hours by rail!* Of course, the air rate as calculated includes no return upon investment and assumes full capacity operation. This may at first seem like a "nigger in the woodpile." But absence of the slightest allowance for decreased cost of large airplanes in production quantities and for other future savings should far more than counter-balance these omissions.

Some Interesting Observations

Some interesting side lights are obtained by studying the passenger mile costs for the various sizes of airplanes. These unit costs, as will be remembered, are as given at the end of Table 6.

TABLE 6—SCHEDULED OPERATIONS

Number of Round Trips Per Day	Number of Miles Per Day	Number of Miles Per Year	Number of Hours Per Year
1	790	288,350	2,884
2	1,580	576,700	5,767
4	3,160	1,153,400	11,534
8	6,320	2,306,800	23,068

Number of Round Trips Per Day	Number of Single Trips Per Year	Number of Seat Trips Per Year	Number of Revenue Miles Per Year	Number of Revenue Hours Per Year
1	657	11,826	259 515	2,595
2	1,314	23,652	519,030	5,190
4	2,628	47,304	1,038,060	10,381
8	5,256	94,608	2,076,120	20,761

Number of Round Trips Per Day	Revenue Miles Per Year	10% Allowance	Total Mileage per Year	Total Hours Per Year
1	259,515	25,952	285,467	2,855
2	519,030	51,903	570,933	5,710
4	1,038,060	103,806	1,141,866	11,419
8	2,076,120	207,612	2,283,732	22,837

Number of Round Trips Per Day	Total Hours Per Year	Number of Plane Overhauls Per Year	Number of Engine Overhauls Per Year
1	2,855	2.855	34.26
2	5,710	5.71	68.508
4	11.419	11.419	137.028
8	22,837	22.837	274.044

Round Trips per Day	1	2	4	8
5-passenger airplanes	14.9c	12.7c	10.7c	9.2c
10-passenger airplanes	13.2c	11.6c	9.7c	8.7c
18-passenger airplanes	11.0c	9.5c	8.1c	7.1c

From this compilation it can be seen at a glance that *the most economical size of airplane depends upon the scale of operations.* For example, if we assume traffic volume of about 36 to 40 passengers each way daily, the three sizes of ships compare as follows: 5-passenger about 9.2c; 10-passenger about 9.7c; 18-passenger 9.5c. Evidently, for this volume of traffic *and for the route which we considered* the small airplane is the most economical unit to use. On the other hand it is evident that the largest size airplane will become more economical for this route if the traffic is greater than 36 to 40 passengers each way daily.

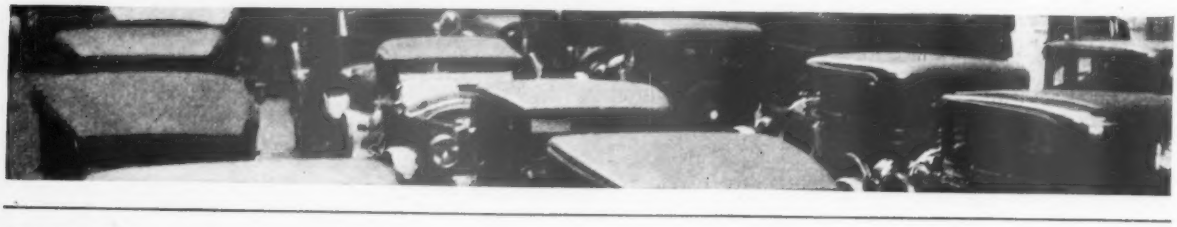
TABLE 7—CAPITAL INVESTMENT

Equipment

Round Trips per Day:	1	2	4	8
Cabin monoplane, complete with cabin heater and 3—500-HP engines with starters at $80,000, list price	$320,000	$532,000	$ 792,000	$1,224,000
Spare 500-HP engines at $8,500, list price	34,000	48,450	68,850	107,100
Set spare wings complete with tanks, flaps, ailerons, struts, etc. (crated)	8,500	10,000	14,000	17,000
Spare undercarriage (crated) less wheels	1,950	3,900	3,900	3,900
Set spare wheels with brakes, tires, etc. (crated)	750	1,500	1,500	1,500
Set spare tail surfaces, complete	1,540	3.080	3,080	3,080
Set navigation lights, landing lights, parachute flares with brackets, storage battery and other special airplane equipment	2,936	5,138	8,074	13,212
Trucks: 1½ ton panel body, delivered	1,500	2,250	3,000	3,750
Miscellaneous spare parts and supplies, about	3,500	4,000	5,000	6,000
Miscellaneous crating and shipping costs, about	1,000	1,500	2,500	3,500
Shop and office equipment at flying fields, about	5,000	7,500	10,000	12,000
Executive and traffic office equipment, about	4,000	5,000	7,500	10,000
Total Equipment Costs	$384,676	$624,318	$ 919,404	$1,405,04[illegible]

(Table continued on page 40)

Flyers call it the safest and most dependable light plane for SPORT *and* TRAINING



THE OUTSTANDING SPORT AND

PUT the Whittelsey Avian through its paces. Not with the conscious effort of a "show-off" but with the supreme ease of a born aristocrat this famous light plane responds to every wish and whim of its pilot.

From the moment you give it the gun until it floats into a gentle three-point landing, propeller still, stick dead, the Avian gives a flying performance that is a happy combination of stability, ease-of-handling, speed, durability and safety.

It's the creation of genius. It must be. For since it first took to the air, more than six years ago, to write in the sky-lanes of the world a glorious history of achievement, many designers have attempted to duplicate the Avian. They have copied it line for line, angle for angle. Still, the Avian remains the choice of the experienced pilot—as a ship in which to train the fledgling, as a ship to fly for sport.

1. You can't take it off the front porch. But no light plane is quicker to lift its nose into the air and leave the ground behind. By the same token, you can land the Avian in any pasture of decent size.

And from take-off to landing the Avian will give you the most comfortable, satisfying flight.

Among the features that make the Avian the most suitable light plane for day-in and day-out flying—whether training or touring—are:

SAFETY: With 8 the factor of safety the Avian is one of the most popular planes for sport and training. Airworthiness permits aerobatics at a total loaded weight of 1450 pounds, normal flying at a weight of 1600 pounds. The Avian, pilot, passenger and 50 pounds of baggage weigh 1410 pounds.

2. Slotted wings (Handley-Page) make a spin practically impossible. And statistics show that the accidents due to spins exceed in number those due to all other mechanical difficulties and human mistakes. This safety feature also allows the landings of the Avian at slower speeds.

ECONOMY OF OPERATION: Fuel consumption 20 miles per gallon and oil consumption 500 miles to the gallon.

EASE OF MAINTENANCE: Most working parts being fitted with lubricators, indicate the ease with which the Avian can be maintained. The engine is at comfortable height from the ground for purposes of adjustment. Engine cowling can be detached in a few moments.

The whole of the fuselage is separated from the power unit by a fireproof bulkhead.

3. COMFORT: The cockpits of pilot and passenger are roomier and more comfortable than usual. Occupants are protected by adequate windscreens. The luggage compartment behind the pilot's seat is large enough to accommodate two full-sized suitcases, tools, spare tire, etc.

4. EASE OF HANDLING: One person can fold or spread the wings unassisted. When wings are folded one person can easily lift the tail and manoeuver the machine without effort. The wide track of the undercarriage and the steerable tail skid make taxying easy.

When the wings are folded the Avian occupies a space only 9½ feet in width (1-3 its width when wings are spread). It can be garaged in any ordinary shed.

For training purposes the Avian has a dual control. For sport flying the control column in the front cockpit can be removed and the rudder-bar disconnected.

Records it holds. — First solo flight England to Australia . . . Fastest time England to Australia . . . Longest flight ever made in a light plane . . . Longest solo flight ever made . . . Fastest time England to India . . . First non-stop flight, London to Rome.

Write for information. If you are interested in the Whittelsey Avian as a purchaser or if you plan the conduct of a training school, write us. We will gladly forward complete and detailed information concerning this light training and sport plane. Its price is $4995 flyaway or F. O. B. Bridgeport, Conn. Whittelsey Mfg. Company, Dept. D-2, General Office and Plant, Bridgeport, Conn.

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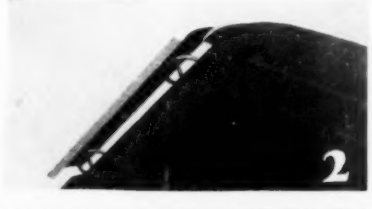
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AVRO AVIAN
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MONEY TO BE MADE—We are completing national distribution and arranging representation in the leading aviation centers of the country. Interested and responsible parties are invited to write for further information concerning sales plan and territories available. Whittelsey Mfg. Co., Bridgeport, Conn.

TRADE MARK WHITTELSEY AVIAN
IN AMERICA

TRAINING PLANE OF THE WORLD

TABLE 7—CAPITAL INVESTMENT (Continued)

Organization and Introductory Costs				
Incidental legal and other organization expense	$ 2,000	$ 2,500	$ 3,000	$ 3,500
Engineering services on traffic surveys, selection of route operating bases, planning of operations, etc., about	5,000	7,500	10,000	15,000
Six round trips over route for demonstration purposes, 4,740 miles	9,371	8,134	6,887	6,039
Introductory, advertising, publicity, etc., about	6,000	7,500	10,000	15,000
Miscellaneous small expenses, about	3,000	6,000	10,000	15,000
Total Introductory Costs	$ 25,371	$ 31,634	$ 39,887	$ 54,539
Total Equipment Costs	384,676	624,318	919,404	1,405,042
Total Investment—excluding Working Capital	$410,047	$655,952	$ 959,291	$1,459,581
Working Capital				
The amount allowed under this head will depend greatly upon what the traffic prospects are. However, for the purpose of these estimates it is considered that traffic available is excellent. In first estimates of this character it seems advisable to allow a sum at least equal to the total of all operating charges for a period of 4 months, or about	171,143	297,012	503,630	886,125
Total Investment Required	$581,190	$952,964	$1,462,921	$2,345,706

TABLE 8—OPERATING COSTS FOR ONE YEAR

Round Trips per Day:	1	2	4	8
Fixed Operating Costs				
Rent of hangars and use of fields at New York and Cleveland and intermediate fields	$ 7,000	$ 12,250	$ 19,250	$ 31,500
Rent of executive offices at New York	2,500	3,000	5,000	7,500
Depreciation of airplanes, equipment and spare parts (less engines)	48,776	78,994	114,020	169,918
Depreciation of motor trucks	500	750	1,000	1,250
Depreciation of shop, office, miscellaneous parts and equipment	1,875	2,475	3,375	4,200
Airplane insurance	73,934	120,812	178,280	273,958
Insurance on ground equipment, workmen's compensation, etc	1,550	3,300	5,800	10,800
General and Operations Manager	6,500	8,000	12,000	15,000
Assistant General and Operations Manager	4,000	5,000	6,000	7,500
Engineering, accounting, legal and other professional services	6,000	8,000	12,000	18,000
Base Pay of First Pilots at $3,000 per year	9,000	21,000	42,000	84,000
Base Pay of Second Pilots at $2,000 per year	4,000	10,000	16,000	28,000
Chief Mechanics at $4,200 per year	4,200	8,400	8,400	12,600
First Class Mechanics at $3,640 per year	10,920	18,200	29,120	47,320
Second Class Mechanics at $3,120 per year	9,360	15,600	24,960	40,560
Utility Clerks at $1,690 per year	3,380	6,760	8,450	13,520
Bookkeepers at $2,080 per year	2,080	4,160	6,240	8,320
Stenographers at $1,560 per year	3,120	4,680	6,240	9,360
Office supplies, printing, telephone, postage, etc., about	1,500	2,500	3,500	4 500
Sub Total	$200,195	$333,881	$ 501,635	$ 787,806
Contingencies and Miscellaneous, 10%	20,020	33,388	50,164	78,781
Total	$220,215	$367,269	$ 551,799	$ 866,587
Variable Operating Costs				
Airplane gasoline, oil and grease	$ 72,803	$145,580	$ 291,185	$ 582,344
First Pilot's mileage pay	14,273	28,547	57,093	114,187
Second Pilot's mileage pay	8,564	17,128	34,256	68,513
Depreciation of engines	32,680	64,382	127,199	253,617
Allowance for crash losses not covered by insurance	4,750	9,500	19,000	38,000
Airplane periodic overhauls	8,565	17,130	34,260	68,520
Engine overhauls	23,982	47,964	95,928	191,856
Trucking, express and freight, about	1,200	1,800	2,500	3,200
Motor Transport	2,000	2,500	3,000	3,500
Pilot's travel expenses	4,380	8,760	17,520	35,040
Other travel expense	1,500	2,500	3,500	4,000
Telephone, telegraph, mail, etc., on operations, about	1,000	1,500	2,000	2,500
Sub Total	$175,697	$347,291	$ 687,441	$1,365,277
Contingencies and Miscellaneous, 10%	17,570	34,729	68,744	136,528
Total Variable Operating Cost	$193,267	$382,020	$ 756,185	$1,501,805

(Table continued on page 44)

"Like flocks that unafraid explore the shifting highways of the air, I have no fear but that my leader should outwing me in the empty sky."—*Translated from the Japanese of Lady Murasaki by Arthur Waley.*

Squadron in line

Aeronautics

Aeronautics is the most widely-read of all aviation periodicals. You will find it on the verandahs of bungalows in India, in the book-racks of ships in island waters, and among the half-dozen magazines in a rest-house along the Mandarin Road in Indo-China. You may pick it up from the reading-tables of clubs and hotels in every European capital. It is on file in 63 American consulates. Aeronautics is presenting the story of American aviation to alert minds everywhere. The following list, although not exhaustive, gives an idea of the world-wide circulation which Aeronautics enjoys. Aeronautics is on sale in every city mentioned:

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Glasgow
Stockholm
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Madrid
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Santander
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Bexhall-on-Sea
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Southampton
Lyons
London
Nice
Venice
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Baden-Baden
Verdun
Copenhagen
Birmingham
Paris
Naples
St. Sebastian
Algiers
Alexandria
Capetown
Luxor
Cairo
Jerusalem
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Calcutta
Dalhousie
Harbin
Bangkok
Hong Kong
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C. deF. Chandler
Editor of the Series

THE Ronald Aeronautic Series is the world's only organized, comprehensive source of up-to-date, reliable, and technically accurate information on aeronautics in *all* its developments. Each subject is covered by a specialist who is acknowledged as *the* outstanding authority on the field with which he deals. The editor, Lieut. Colonel Charles deF. Chandler, is well known in aeronautic circles, not only as a pioneer airplane and balloon pilot, but as one of the foremost technicians of this country.

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Simple Aerodynamics and the Airplane

By Charles N. Monteith, *Chief Engineer, Boeing Airplane Co.;* **3d edition revised by Colonel C. C. Carter,** *U. S. Military Academy, West Point.*
418 pages, 211 illustrations, $4.50

A COMPLETELY revised and enlarged edition of a famous introductory textbook widely used in ground and flying schools, in colleges, technical schools and universities. It is ideally suited to the home-study needs of the individual not associated with any school.

Includes a general discussion of airplanes; characteristics and types of airfoils; explanations of lift and drag; center of pressure and its movements; plotting of coefficients and characteristic curves; distribution of forces; selection of airfoils; rate of climb; landing speeds; combining airfoils; parasite resistance; characteristics of aircraft engines; discussion of component parts of an airplane; stability considerations and its attainment; control surfaces; the propeller; airplane performance; dynamic loads, maneuverability and controllability; structural considerations; wind tunnels; discussion of airplane types for specific performance; methods and instruments for navigation of aircraft; airplane accessories; parachutes; radio; aerial photography; etc.; etc.

International Airports

by Stedman S. Hanks, *Lt. Colonel, Air Corps Reserve.* **195 pages, 48 illustrations, $5.00**

COLONEL Hanks supplies detailed information regarding European airport practice obtained through a recent tour of leading foreign airports and compares this with American practice on which he is a leading authority. He describes the design, construction, and operation of such airports as Croydon, London; Tempelhof, Berlin; Schiphol, Amsterdam; Waalhaven, Rotterdam; Statens Lufthavn (Kastrup), Copenhagen; Basel, Switzerland; Littorio, Rome; Taliedo, Milan; Le Bourget, Paris.

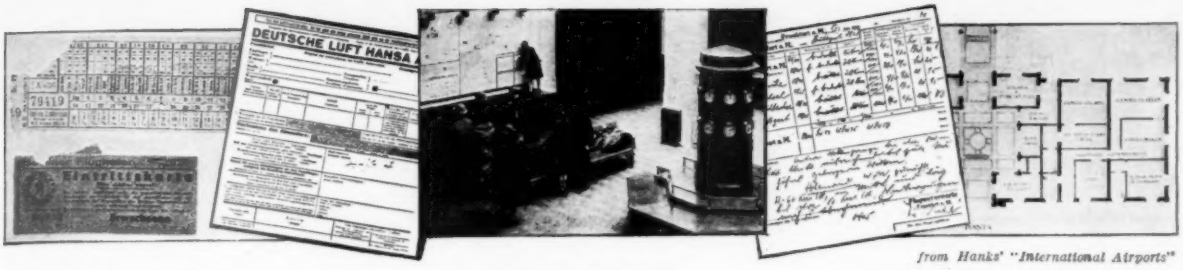
He points out how American airports may secure substantial additions to revenue by adapting ideas that are in successful use abroad. A translation of an actual profit and loss statement of a foreign airport is an interesting feature. Among the subjects discussed are passenger facilities at airports; tickets; baggage regulations; German development of combination air and rail service for express shipments; an outline of an ideal airport combining the best features of American and European airports; specimens of foreign air travel publicity material; etc., etc. Numerous forms are reproduced and translated.

Aviation: Its Commercial and Financial Aspects

by Richard Rea Bennett. 127 pages, 4 illustrations, $3.00

THIS book provides for the first time an impartial, critical guide for the investor, the banker, the manufacturer, and everyone else who wishes to know the real status of aviation. Mr. Bennett supplies an authoritative, unbiased analysis of the financial and commercial position of aviation and of its trends. The various phases of the new industry are surveyed to reveal its features of strength and of weakness.

Among the subjects treated are: Prospects for future development of air transportation. Statistics of industry. Aeronautic education. Is commercial aviation a legitimate business investment? Banker's warning to over-enthusiastic investors. Is drastic readjustment in sight—with failure for weaker companies? Outlook for manufacturers. What kind of air routes pay today? Is average price of aeronautic stocks justified by present or prospective earnings? Check list of points prospective investors should consider. Will a few consolidations dominate aviation? Trends in airplane construction. Marketing problems. Operating costs. Relation of airports to expansion of commercial aviation.



from Hanks' "International Airports"

Elements of Aviation

by Colonel V. E. Clark, *formerly Chief Aeronautical Engineer, U. S. Army.* **193 pages, 24 illustrations, $3.00**

THIS book by a world-famous aircraft designer is the first book you should read if you wish a clear understanding of why an airplane flies, why it is stable or unstable, controllable or uncontrollable, in various attitudes and conditions—in short, "why an airplane does what it does." It will give you the basis for a sound understanding of all the essential principles of aviation—yet its explanations are so plain that even a schoolboy can understand it. But though its explanations are simple they are absolutely authentic—it is so complete that even the experienced airplane engineer will obtain from it many new and valuable conceptions.

Colonel Clark explains all the phenomena encountered during airplane flight in a thorough yet readable way, and without complex mathematics. He shows that a few fundamental principles of elementary physics (which are explained in detail), when properly understood and applied, account for everything that can happen to an airplane in flight as regards stability and control.

Aircraft Power Plants

by E. T. Jones, *Chief Engineer, Wright Aeronautical Corporation; and other experts.* **208 pages, 104 illustrations, $4.25**

DISCUSSES frankly the favorable and unfavorable features of engines and accessories available, also the performance characteristics that may be expected.

The section on aircraft engines and accessories explains and compares the various kinds of engines without going into thermodynamic formulas. The adaptability for specific purposes is carefully pointed out, with practical notes on operating features supplemented by many diagrams. Accessories described embrace ignition systems, carburetors, radiators, fuel piping pumps, reversing mechanisms, and superchargers, lubrication and quality of engine fuels.

The section on design and construction of propellers explains clearly and concisely the principles of air propellers. The fundamental basis of fluid propulsion, the airfoil or zone theory, static thrust, and effect of body interference, are presented. Formulas, data, and plan-forms sufficient for design of ordinary types are included.

Practical Flying

by Major B. Q. Jones, *Air Corps, U. S. A.* **210 pages, 6 illustrations, $3.00**

THIS book is by a famous Army flyer who has trained thousands of pilots. Major Jones has been flying since 1913; he was the first man to take up a plane and purposely put it into a stall to find out exactly what happened and what to do; during the War he was Chief of Aviation Training.

First Major Jones outlines the physical and mental characteristics that you should possess if you wish to become a pilot. Then he describes all the parts of a plane; and explains technical expressions and slang terms.

From this he proceeds to provide clear and concise answers to the hundreds of questions that student pilots ask. A variety of practical subjects is covered, such as the most useful instruments for each class of flying, particularly "blind" flying; why a magnetic compass spins during fog flying; "dead stick" landings; etc. Major Jones explains in detail the causes of crashes during take-offs and turns for landings; how to recognize stalls in time and correct for them; how stalls progress into spins and how to get out of them easily.

Aeronautical Meteorology

by Willis Ray Gregg, *Senior Meteorologist, in Charge of Aerological Division, U. S. Weather Bureau.* **144 pages, 44 illustrations, $2.50**

PILOTS and executives of air transport companies will find in this volume information of a practical nature regarding the force and direction of winds at various altitudes, the frequency of fogs, visibility, and similar subjects that affect the reliability of scheduled flights. The discussion of these subjects is given fully and is supplemented with many graphic charts from which exact values may be taken.

Among the subjects included are: how to read weather maps; using local observations for immediate forecasts of probable flying conditions; weather forecasting from clouds; the average height of clouds of each class; the variation in direction and velocity of winds with change of altitude; the frequency of winds from each direction at various altitudes; the characteristics and dimensions of thunderstorms; general circulation of the atmosphere; visibility; instruments and methods of observation; cyclones and anti-cyclones; weather-map making and reading; distribution of weather forecasts by radio; etc., etc.

Airplane Stress Analysis

by Alexander Klemin, *Professor of Aeronautical Engineering, Daniel Guggenheim School of Aeronautics, New York University.* **277 pages, 105 illustrations, $7.00**

IN this introductory treatise, Professor Klemin shows step by step how to make all the calculations in the airplane stress analysis required by the Department of Commerce. The book is intensely practical—each point is explained with the utmost clearness and simplicity; advanced mathematics has been avoided so far as possible. To show the reader just how the calculations are made in actual practice, Professor Klemin takes an airplane of average characteristics and gives full examples of all the computations required. A preliminary review explains the principles of applied mechanics involved and develops the formulas that furnish the foundation for these computations. In concise, easily usable form, data on materials of aircraft construction to which the calculator must frequently refer, is assembled for convenient reference.

Engineering Aerodynamics

by Walter S. Diehl, *Lieutenant (C.C.), U. S. Navy, Bureau of Aeronautics.* **288 pages, 159 illustrations, $7.00**

PROVIDES practical information on aerodynamics, presented in forms suitable for direct application by aircraft designers and advanced students of aeronautical engineering. A large amount of data has been analyzed and presented in the form of working diagrams and equations—much of the subject matter is original, about two-thirds not having before been available.

Lieutenant Diehl shows how the modern theories of lift and drag are applied to everyday design problems. He gives detailed methods for calculating and estimating performance; shows how performance tests are made and how the observed data are reduced to standard conditions.

Supplemented by a description of the various methods which may be employed to select an airfoil section for a particular purpose, test data are given for a number of standard wing sections. Flap and aileron test data are presented in new and convenient form. The chapter on parasite drag includes selected data on struts, wires, fuselages, streamline bodies, etc. The book also includes an explanation of methods of conducting and interpreting wind tunnel tests; how to interpret model test data; methods for designing control surfaces, methods for rapid performance estimating; etc.

"THE Ronald Aeronautic Series is complete and accurate. I find this information most valuable, not only for the technical man, but for the non-technical man as well. I believe everybody should have these books in their collection."

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TABLE 8—OPERATING COSTS FOR ONE YEAR (Continued)

Traffic Costs				
Rent of ticket office space at New York			$ 1,200	$ 2,000
Rent of ticket office space at Cleveland	$ 900	$ 900	1,000	1,500
Traffic Manager (New York)	6,000	7,000	8,500	10,000
Assistant Traffic Manager (Cleveland)	4,500	4,500	5,000	6,000
Traffic Solicitors at $2,750 per year	11,000	16,500	22,000	27,500
Stenographers at $1,560 per year	4,680	6,240	7,800	10,920
Clerks at $1,040 per year	2,080	3,120	4,160	5,200
Printing, mimeographing and other direct mail work on air mail, package and passenger development	7,500	10,000	12,000	15,000
Advertising, magazine, poster and miscellaneous	15,000	20,000	25,000	30,000
Publicity work New York and Cleveland	7,500	8,500	10,000	12,000
Commissions, about	30,000	50,000	85,000	140,000
Telephone, telegraph and mailing, about	1,200	1,500	2,000	2,500
Office supplies, about	500	600	800	1,000
Sub Total	$ 90,860	$128,860	$ 184,460	$ 263,620
Contingencies and Miscellaneous, 10%	9,086	12,886	18,446	26,362
Total Traffic Costs	$ 99,946	$141,746	$ 202,906	$ 289,982
Total Fixed and Variable Operating Costs	413,482	749,289	1,307'984	2,368,392
Total Operating Costs Including Traffic Department	$513,428	$891,035	$1,510,890	$2,658.374

TABLE 9—UNIT OPERATING COSTS

Round Trips per Day:	1	2	4	8
Fixed Operating Cost per Revenue Mile	$ .849	$ .708	$ .532	$ .417
Fixed Operating Cost per Revenue Trip	335.32	279.19	209.94	164.82
Variable Operating Cost per Revenue Mile	.745	.736	.728	.723
Variable Operating Cost per Revenue Trip	294.15	291.01	287.76	285.69
Total Fixed and Variable Operating Cost per Revenue Mile	1.593	1.444	1.260	1.140
Total Fixed and Variable Operating Cost per Revenue Trip	629.31	570.22	497.80	450.50
Traffic Cost per Revenue Mile	.385	.273	.195	.139
Traffic Cost per Revenue Trip	152.04	107.33	77.12	54.90
Total Cost (including Traffic Costs) per Revenue Mile	1.978	1.717	1.455	1.28
Total Cost (including Traffic Costs) per Revenue Trip	781.47	678.10	574.92	505.78
Traffic Costs Percentage of Total Cost	19.4%	15.9%	13.4%	10.9%
Total Costs per Passenger Mile	$ .11	$ .095	$ .081	$ .071

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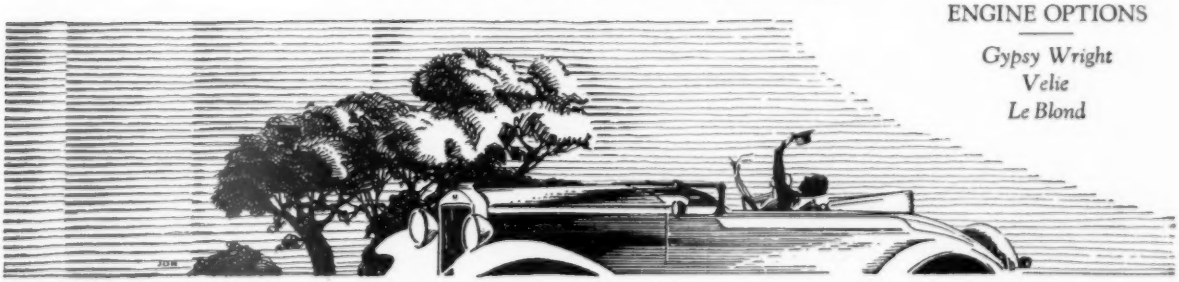

Star Aircraft Co.

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With the Industry

Detroit Aircraft Corporation

THE latest consolidation to receive attention was that of five companies into the Detroit Aircraft Corporation, embracing in the directorate many well-known figures in the aeronautical and automotive fields. The company includes Ryan Aircraft Corporation, Aircraft Development Corporation, Eastman Aircraft Corporation, Blackburn Aircraft Corporation of Michigan, and a part ownership in the Winton Aviation Engine Company. There is also included the Grosse Ile airport just outside Detroit.

The officers are: E. S. Evans, president; Harold H. Emmons, chairman of the board; Carl B. Fritsche, vice-president; Charles A. Parcells, secretary; Edward T. Gushee, treasurer. The directorate consists of the above officers, the members of the executive committee, which is composed of William B. Mayo, C. F. Kettering, Harold H. Emmons, Eugene W. Lewis, and C. S. Mott, and the following men: Arthur Schwartz, R. E. Olds, R. D. Chapin, Frank W. Blair, C. H. Harrah, Sheldon R. Noble, J. Speed Elliott, Thomas N. Dysart, Harold M. Bixby, P. DeC. Ball and Harry H. Knight.

Ryan Aircraft Corporation is well known, has a substantial export business and large sales organization. The Aircraft Development Corporation is now building the ZMC-2, an all metal dirigible for the United States Navy, and has developed a fast speed metal riveting machine. Eastman Aircraft Corporation has developed a moderate priced flying boat, the "Sea Rover." The Winton Aviation Engine Company was recently organized for the development and manufacture of Diesel engines for aircraft, as a subsidiary of the Winton Engine Company. Blackburn Aircraft Corporation was organized to acquire all rights for the Americas, except Brazil, of the Blackburn Aeroplane & Motor Company of England, manufacturers of military aircraft and flying boats.

Standard Increases Service

Standard Airlines, Inc., operating between Los Angeles and El Paso, have announced a reduction of express rates, and the opening of a fifty-five minute service between Los Angeles and the Big Bear Valley.

New York-Boston Seaplane Service

The Airvia Transportation Company announces an immediate program including two hour seaplane service between New York and Boston, and ten hour service of the same kind during the winter months between New York and southern coast resorts. Savoia-Marchetti double hulled fourteen seater cabin flying boats will be purchased from the American Aeronautical Corporation, American licensees for these planes. The New York landing place will be in the Hudson, and at Boston will be in the vicinity of South Station. E. K. Jacuith will have charge of the operating personnel.

Shortest Air Route

Contract Ail Mail Number 31 is the shortest air mail route in the world. It operates between the Municipal Field, Chicago, and the lake front, and speeds up mail deliveries from thirty minutes to two hours.

Airport Managers Make Recommendations

At the recent meeting in Cleveland the airport managers made a decided stand against the practice of permitting student instruction at airports from which transport planes carrying mail, express and passengers operate. They recommended separation of shops from passenger terminals; enclosed passenger approaches to loading stations; and the development of permanent structures of architectural beauty.

Chamber Aids Time Payment Plan

The Aeronautical Chamber of Commerce is aiding in the development of uniform legislation applying to time-payment financing of airplane purchases. The Department of Commerce will make a distinction between the purchaser and the owner for financial purposes in the enforcement of certain regulations.

Garland-Clevenger Starts Branch

The Garland-Clevenger School of Aeronautics at Tulsa, Okla., have announced the opening of a branch school which will operate from the Municipal Airport at Amarillo, Texas.

Fairchild Celebrates Birthday

The Fairchild Aviation Corporation celebrated its third birthday by producing its 250th plane at Farmingdale, and announced that within this period the number of employees had grown from nine to an even 800. This latter figure does not include the three hundred odd employees working at the recently acquired Kreider-Reisner plant at Hagerstown, Md.

New Bellanca Seaplane

In its initial tests on the Delaware River waterfront of Bellanca Field, New Castle, Del., the first Bellanca seaplane averaged 11 seconds for take-off, 135 miles per hour high speed and a climb of 1,000 feet in 55 seconds. George Haldeman was test pilot. The first ship was sold to A. Sidney Dawes, Montreal contractor and sportsman, who will use it for business and hunting expeditions.

Art Goebel Opens School

Colonel Art Goebel, who needs no introduction, has opened the Art Goebel School of Flying at the Municipal Airport, Kansas City, Mo.

Fairchild Announces School

The Fairchild Aeronautical Institute has been opened at Farmingdale, Long Island, under the supervision of William J. McDonough.

Seymour Says Something

At the recent conference with the air mail contractors, called to consider the lowering or adjusting of payment rates for carrying air mail, L. D. Seymour of the National Air Transport called Postmaster General Brown's attention to the fact that all pioneering has not yet been done, and that no one has any idea of what it will cost to develop the necessary speed increase of 50 per cent. For that reason a necessary margin or leeway must be permitted the operators in rate adjustments to permit them to pioneer in this field and in solving the problems of radio communication, ice-formation and fog-landings.

Kreider-Reisner Absorbed

Since the absorption of Kreider-Reisner Aircraft Company of Hagerstown, Md., by Fairchild Aviation Corporation, the production has been stepped up to a twenty-four-hour basis to render possible the production of 500 Fairchild "KR" planes, formerly known as Kreider-Reisner Challengers.

Colonial Forms Service Company

Colonial Airways of New York City have formed the Colonial Flying Service and ordered a fleet of fifty craft from Fairchild in order to operate the contemplated schools, sales division, aerial taxi, charter and photographic service. R. W. Fulton is director of sales. The company plans schools at fifteen different airports, including Boston, Hartford, Newark, Albany, Schenectady, Utica, Syracuse, Buffalo and Rochester. Sales and distribution points will be at Boston, Newark, Hartford, Buffalo, Albany, Schenectady, Utica and Syracuse.

Maddux Expands Again

Maddux Airlines have started regular service between the San Francisco Bay

(Continued on page 71)

Individual Air Training

Means Success For You

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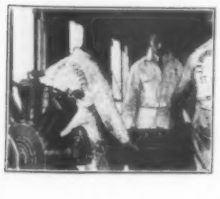
The Wright School has complete ground and flying equipment: every facility to train you in the modern science of aeronautics. You are taught to fly in new planes, licensed by the government, and by licensed transport pilots. Our location, at the crossroads of three of the great air lanes, was chosen after careful consideration. Here you are away from big cities, rivers, mountains, and dangerous air currents. You are surrounded by level country . . . ideal landing fields on all sides. There are no distractions. You can apply yourself solely to the job of learning aviation . . . while you receive individual instruction from veteran aviators.



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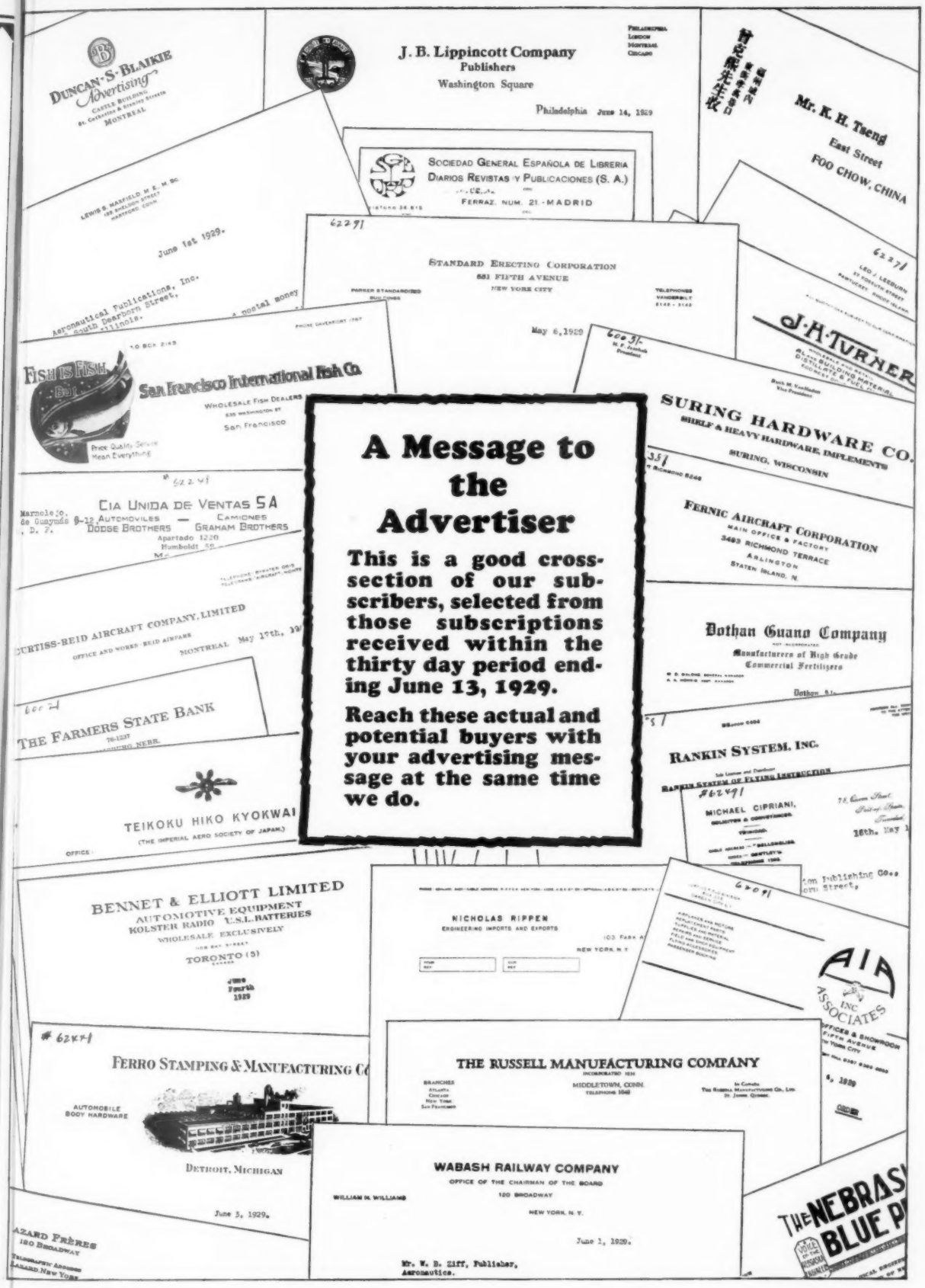
3. THE WEALTHY SPORTSMAN whose commercial interest and sports hobbies make him an ideal prospect.	Millionaire scion and former war ace of Minneapolis, Minnesota.
4. THE AIRMINDED UNIVERSITY PROFESSOR whose influence prevails among the educators of the country as well as the future airminded public.	Member of the faculty of the University of Kansas.
5. THE AIRMINDED PROFESSIONAL MAN whose service to his clients and patients will often involve the use of fast air transportation.	Head physician of a leading medical clinic in San Antonio, Texas.
6. THE AIRMINDED LEGISLATOR whose political influence is far reaching in its effect on the future of aeronautics.	Member of the Supreme Court of South Dakota.
7. THE AIRMINDED CHAMBER OF COMMERCE which exerts considerable influence on the industry of its city and affords a real opportunity towards cooperation in making of its city an air center.	Chamber of Commerce of an important commercial city in the State of Pennsylvania.
8. THE AIRMINDED FOREIGNER who is as much a prospect for an American-made aircraft as he is for that made in his own country.	*Foreign air society*—the imperial aeronautical society of the leading and most progressive country in the Far East. *Foreign sportsman*—a wealthy Chinese merchant and sportsman educated in America. *Foreign business man*—an automobile distributor and dealer in an important city of Mexico.
9. THE AIRMINDED BUSINESS MAN who is ever ready to further his own business interests by the practical use of aircraft.	Large manufacturer of machinery located in Freeport, Illinois.
10. YOUR COMPETITOR the aircraft manufacturer who is on the alert to secure exactly the same business which you are endeavoring to build up and is particularly interested in what his competitive aircraft manufacturers are doing.	Fast-growing aircraft company located in Montreal, Canada.

* Names will be furnished upon request.

If you wish to reach those others from whom the aeronautical industry must necessarily draw sustenance, and upon whom the future development and growth of the industry depends, use AERONAUTICS, the largest selling aeronautical publication in the world.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Avigation

By Frank W. Wead

Lieutenant Commander United States Navy

ONE frequently sees, particularly in connection with transoceanic flights, comparisons drawn between the navigation of surface craft and the avigation of aircraft, and indeed, much of the technique used in aircraft has been drawn directly from sea navigational experience. In some instances it fits, in others it is wide of the mark. In some particulars the problems of avigation are similar to those of navigation, in others they are utterly different.

From the course steered and the speed of the propellers calibrated into knots with an allowance for known currents a ship determines its position on the chart. This method is known as dead reckoning. Dead reckoning is not exactly accurate due to the small effect of the wind on the vessel, poor steering, foul bottom and similar causes. For this reason the navigator of a ship takes star sights at dawn and dusk, and morning, noon and afternoon sun sights. These astronomical methods give him three definite fixes or positions each day that the ship is at sea (i. e., morning, noon and evening). Early morning and evening sights of several stars give intersecting lines of position. They afford a "fix" at that time.

Morning and afternoon sun sights, however, give only longitude, while the noon sight gives only latitude. A combination results in one fix a day from the sun, at noon. When the ship approaches land radio bearings and bearings of known objects are taken at brief intervals and soundings also are used in fixing position. These methods are known as piloting. It is vital that a ship near shore know its exact position at all times in order that rocks and shoals may be avoided.

An airplane, however, instead of encountering new dangers when a landfall is made reaches a zone of safety, where, in clear weather, its position can be accurately ascertained by a single glance at the terrain below.

Ordinary surface vessels cruise at from ten to twenty knots, while aircraft cruise in the neighborhood of one hundred miles an hour. At the end of an hour for surface craft, except in most abnormal localities, conditions will have altered but little in the ten or twenty miles traversed, and those factors that tend to make course keeping inaccurate will have remained fairly constant. In a belt of one hundred miles, however, quite radical changes in wind and weather are possible.

It is for this reason that an aircraft must keep a closer running record of its course than does a surface craft. This record consists of dead reckoning or following a radio direction beacon or a combination of both methods. The radio beacon sends signals in "bands," which are received in the plane and give information that the aircraft is on the correct course between the two points between which the beacon is operating, or is to the right of it, or to the left of it. If to the right, for example, the plane merely heads to the left until "on" the course again.

For accurate dead reckoning in aircraft the drift or windage should be determined say every twenty minutes and if necessary the course corrected accordingly. Drift is obtained by observing white caps or smoke bombs with a drift indicator, or over angle lines painted on the horizontal tail surfaces, or by simple estimate by eye.

It is obvious that dead reckoning is more vital in avigation than it is in navigation, while piloting, which is most important for ships, means little to aircraft.

A ship runs but fifty or a hundred knots between definite fixes (morning, noon and evening) obtained by the method of star and sun sights that form a navigator's "day's work." In the same intervals an aircraft will cover from five to seven hundred miles, in the course of which, if dead reckoning is not closely followed, it may get many miles off its course. One cannot move the stars or the sun, and the present method of day's work seems to be the best possible, but the indication is that it is woefully inadequate for that phase of avigation which corresponds to nautical astronomy.

When a long over-water flight is successful much of the credit is invariably and justly given to the expertness of the avigation. When such a flight fails the implication usually is made that avigation may have been faulty and possibly the cause of the disaster. Some such successful flights have been well prepared and equipped from a navigational standpoint, others have had little but a compass and the pilot's ability to judge drift to keep them on their course.

Considering all of them—Brown-Alcock, Reid, Maitland-Hegenberger, Bronte, The Army World Flight, Goebel, Jensen, de Pinedo, Costes-LeBrix, Earhart, Elder-Hageman, Cabral, Brock-Schlee, Lindbergh, Jiminez-Iglesias, Ferrarin-delPrete, and the rest,—it seems impossible to say that if those that carried complete avigational equipment had lost it in the first fifty miles they would not have reached their destination just the same. The vital point in such flights is that of motor failure and fuel supply, and the fundamental necessity for avigation, as the records clearly show, is for dead reckoning,—and it may be pretty crude dead reckoning at that.

Surely the finest flight yet made was that of the Southern Cross from San Francisco to Australia in three hops. Everyone connected therewith deserves all the credit that there is, including Warner, the radio man, and Lyons, an experienced navigator. Yet, the Bureau of Aeronautics News Letter of June, 1928, stated: (speaking of the flight from San Francisco to Honolulu): "The Southern Cross made a successful flight, depending upon dead reckoning and bearings from ships en route. The radio beacons in this case were of little assistance."

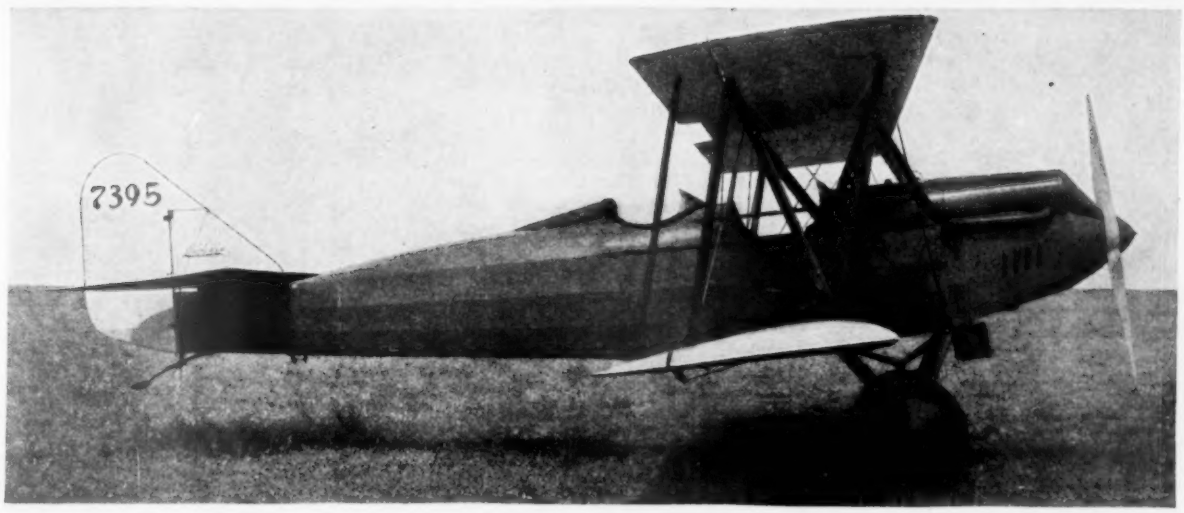
It is rumored that when Art Goebel arrived at the Oakland Airport preparatory to winning the Dole flight and before he persuaded Lieutenant Davis to accompany him as avigator he pulled a sextant from his cockpit and said:

"Say, does anybody around here know how to work one of these darn things?"

It is also recounted that Marty Jensen, who placed second in the Dole contest, carried with him as navigator a grand old man of the sea named Captain Paul Schluter. The Skipper was accustomed to the old-fashioned time sight for longitude and meridian altitude for latitude method of navigation. Upon arrival at the Longitude of Honolulu no land was sighted so it was necessary for Jensen to fly in circles until local apparent noon, when the Skipper shot the sun and determined that they were north, rather than south, of the Islands. Jensen promptly headed for Wheeler Field, some sixty miles away, and arrived only to find that Art Goebel, and his avigator, Lieutenant Bill Davis, USN, had grabbed the first plum. It is said that Davis rode the radio beacon all the way, checking his course frequently by drift observations and checking his position by occasional sights of the sun and stars.

A sextant, of course, is quite useless

XUM



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without a chronometer or watch, mathematical tables or graphs, and a knowledge of navigational methods, and it appears to be physically impossible for one man to fly and at the same time take sights and work them out. However, if Mr. Lindbergh took any of these things with him on his flight to Paris, the fact has carefully been omitted from all reports of that epoch-making journey, and, after all, the fact remains that Lindy reached his destination quite neatly.

Now, do not assume that I recommend that aircraft go barging off on transoceanic journeys without any visible means of avigation. Quite the contrary. Every such aircraft should contain an experienced avigator who appreciates the value of the various phases of avigation in the order of their relative importance, viz.: dead reckoning, radio, nautical astronomy.

Few ship navigators are qualified for such a task because they know little of drift and aerial dead reckoning. The majority of aviators, however, including the best cross-country pilots, are handicapped by lack of knowledge of radio direction finding and nautical astronomy. The ideal combination exists only in a few individuals.

On the other hand, if a pilot is planning a long transcontinental flight, he really doesn't need a navigator, and I'd advise him to leave his sextant at home on the mantel in its plush-lined case and to take a map instead.

Theoretically at least, the cross-country pilot before taking off draws a line on his map from starting point to destination. In practice he may draw it only with his eye. The angle of this line from true North gives him his compass course. He checks his compass on a surveyed compass rose, on which the true directions are indicated, on the ground before starting and thus knows the error or deviation of his compass on any heading. On any compass course he applies this deviation, and also the variation, which is the difference between true North and magnetic North and which is given on maps and charts for each locality.

Thus he obtains the compass course that he must fly to make good the straight line or true course between his two points. He knows the approximate speed at which he will cruise and hence may roughly estimate his time of arrival at any point, or his approximate position at the end of each hour, and thus determine the points at which he will stop for fuel, lunch, etc. He takes off and steadies down on the determined compass course. He estimates the direction and force of the wind from smoke or from streaks on the surface of ponds or lakes. He changes course a few degrees to the left or right to counteract his drift and thus prevent the wind from sweeping him slowly away from the air line. He reads his last heading by compass and follows that compass course until widening distance from landmarks along his route as shown on the map warn him that the wind has changed and his course needs a correction.

In actual practice, however, especially when traveling over a route that the pilot knows well, he may pay no attention to his compass until he has settled down on the airway after determining his direction by familiar landmarks, railroad lines, etc. Then he notes his compass reading. This is simply a precaution so that he may fly by compass for a time in case landmarks should become temporarily obscured by rain or clouds, or if he should pass over open country with no outstanding landmarks. Ordinarily cross-country pilots follow railroads, and spot their position by the location of towns, lakes, bends in rivers, state highways, and the like.

Towns are usually identified from the angles or pattern formed by the various railroad lines converging there, if rivers, monuments or other distinguishing marks are lacking. Occasionally in a moment of carelessness a pilot may "hit an open switch" and follow a spur line blissfully until it suddenly ends at some factory or mill. Normally he cruises along at a convenient altitude, ever alert for possible landing fields in case of motor failure, and a glance at the map and at the country below him is sufficient to exactly locate his position. Such methods are satisfactory and can hardly be called avigation or navigation.

Colonel Lindbergh's avigation on his flight to Paris was very similar to the method in common use by cross-country pilots, with the added fact that from the Weather Bureau he obtained a forecast of what his wind would be each hundred miles or so along his course. In flying a great circle course, which is the shortest distance between any two points on the earth's surface, it is necessary to change heading or compass course of the plane about every hundred miles. At each such change, if the wind remains constant over the route, its effect on the plane changes slightly, owing to the change in the triangle of forces involved.

It is therefore a great convenience for a pilot flying alone to have his compass courses and drift allowance for estimated wind all worked out on the chart before he starts. If the wind estimates turn out to be correct, all is well, and all that the pilot has to do is change course at the indicated times to follow the predetermined compass course on each leg of his route. If, from the appearance of the water, the wind is greater or less or varies in direction from that estimated, the pilot can change course a few degrees to allow for such variation.

This method is crude, but it is simple, and it is about all that a pilot flying alone can do in an avigational way, and it has carried more than one plane across a considerable expanse of open water to its destination.

Perhaps no transoceanic flight ever ventured upon was as completely equipped and expertly manned from every standpoint, particularly that of avigation, as was the New York-Paris attempt of Commander Byrd. And yet this ship, after making a landfall on the coast of France, wandered for hours over the land of the Lily, unable to locate LeBourget or any other airdrome, and finally landed in the sea at night off Ver-Sur-Mer, escaping catastrophe by a gnat's eyelash.

The answer is simple. France was covered with fog that was too low to fly under and its upper surface was an unbroken blanket of white, hundreds of feet above the earth, that showed no landmarks. Under such conditions no satisfactory method of avigation, navigation or even landing has yet been devised except, as someone has said, "by guess and by God." It is certain that all the sextants, chronometers, the sun and all the stars in the Heavens would be of no help.

Such conditions are the exception, of course, rather than the rule, but this problem is a vital one in air transport development. Fog dispersal at terminals by discharging charged sand into the fog, Claude Neon fog-piercing lights, and controlling the flight path of the plane near the airport by radio, so as to bring it down through the fog to a safe landing, are all under experimental development and may work out satisfactorily.

The earth-inductor and other air compasses now available are excellent. Considerable experimental work has been done with various types of air sextants and with simplified navigation tables such as the Bygrave slide rule, with due consideration given to the advantages of small size, light weight and ease of handling in aerial work.

Lieutenant Commander Weems and others have devoted time and thought to simplified methods for air nautical astronomy. Commander Weems work has, I believe, concerned itself almost entirely with star sights. It must be remembered that the taking of accurate sights in aircraft is not easy and requires much experience, and that nautical astronomy is of little value for aircraft by day when only the sun is visible and of no value whatsoever when the sky is obscured by snow, rain, fog or clouds.

It seems needless to point out that dead reckoning and the radio beacon are of value night and day regardless of weather. Practically no work has been

(Continued on page 88)

"Cowboy" Jim Kelly is T-A-T Graduate

Joint-Holder of World's Endurance Flight Record Enrolled at T-A-T Private Flying School a Year Ago

FLYERS COULD HAVE KEPT UP ANOTHER WEEK
KELLY HONORED WITH CHOICE AS CO-PILOT
Chicago Sunday Tribune
BREAK WORLD'S AIR RECORD
FLYERS LAUDED BEFORE HOUSE
HOFFMAN AND JONES AIDED ROBBINS

"COWBOY" KELLY, a year ago a green rookie fresh from the ranch, is today with Reg Robbins among the world's greatest fliers!

That Reg Robbins chose Kelly as his co-pilot on the world's greatest endurance flight—and Kelly's record during the flight—speaks more eloquently for the thoroughness of T-A-T training than anything we or anyone else can say.

Robbins Watched Kelly Train

Robbins is familiar with T-A-T training methods. Robbins had seen Kelly progress through the school. He knew that he was thoroughly trained. He did not hesitate to choose Kelly for the responsible post of co-pilot and mechanic. He knew that he could depend on Kelly to keep the motor in perfect shape, and to make such delicate adjustments as replacing the broken tachometer shaft while the plane soared 1500 feet in the air, as well as taking his turn at piloting the ship. All this Kelly was thoroughly prepared to do as a graduate of T-A-T. All this you, too, will be prepared to accomplish as a T-A-T graduate.

Kelly Employed by T-A-T

On May 22, 1928, Kelly took his first flight as a student at T-A-T. In February he received his Commercial Pilot's License, and was immediately employed by one of the five related T-A-T companies. He continued his training, however, and on April 29, 1929, took examination at T-A-T for the Transport Pilot's License he now holds.

In a few months Kelly earned back the cost of his training. Today he is famous and well-to-do.

Thorough Training Gets Best Jobs

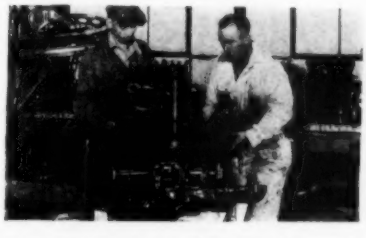
Originally planned with the purpose of Training men to fill the same type of positions which Kelly held with T-A-T . . . training men whom we KNEW were thoroughly trained . . . men with whom we might entrust the precious human cargoes and mail . . . T-A-T training finds its very roots in the ground of thorough training.

Every T-A-T student is considered a prospective member of one of the five related T-A-T companies. Many of the best graduates are offered positions immediately upon graduation, just as Kelly was. Because T-A-T training is based on the needs of the future employer, it is easier for T-A-T graduates to get the preferred positions. At T-A-T Private Flying School you will get the thorough training vital to your success.

As a student at T-A-T, Kelly was a part of a great organization and in touch with its opportunities. So will you be. Your contact with commercial aviation on a large scale will give you flying EXPERIENCE as you train—one reason for Kelly's success.

Veteran Air Mail Pilots Taught Kelly

Veteran Air Mail Pilots will supervise every step of your training. Under these instructors Kelly gained his knowledge of Navigation, Meteorology and Aerodynamics. Kelly's ability to compute wing areas, wing lift, wing curve, lift and drag were of inestimable importance to Robbins in planning the flight and in practical application during the flight. You will train in the perfect flying weather that had so much to do with making the flight of Robbins and Kelly a success. You will train in the same types of ships—all new—that gave Kelly his broad flying experience.



A scene in the shops of Southern Aeromotive Service, Inc., one of the five related T-A-T companies. Here Kelly received the regular mechanical training of all T-A-T students. Here the "Fort Worth" was serviced for the world's record endurance flight after 500 hours previous operation. Here, as a student at T-A-T, you will receive the same thorough training that was responsible for Kelly's choice as co-pilot of the redoubtable Reg Robbins . . . that enabled Kelly to keep the engine in perfect condition during the entire flight!

Enroll Now in School Where Kelly Trained

Letters are pouring in, asking for information. Under no circumstances however, will there be any deviation from the rigid T-A-T policy of keeping classes small. You should write now to insure your reservation.

The coupon below will bring you our 32-page book, "FLYING THE GOLDEN TRAIL." You will find it more interesting than a novel, just as Kelly did. It may not bring you the fame and fortune that it brought to Kelly, but it will open the way to an assured and respected position that holds the greatest rewards for Youth of any industry in History. Write for "FLYING THE GOLDEN TRAIL."

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622 Fort Worth National Bank Bldg., Dept. D
Fort Worth, Texas

Please send me, without obligation, complete details about how I can take the same courses which gave Jim Kelly his training and flying experience.

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Street.....
City.....
Age..... Occupation.....

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Fort Worth
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San Antonio
Houston
Amarillo
New Orleans
Atlanta

Investment Possibilities

(Continued from page 18)

nautical, Keystone Aircraft, and various other companies on the following basis of exchange of the new holding company's stock:

Company—	"A" shares	Common shares
Wright Aero Corp.....	1	3¼
Curtiss Aero & Motor, Inc.	1	4½
Curtiss Airports Corp.....	0	5-12
Curtiss Flying Svc., Inc...	0	5-6
Curtiss Aero Exports Corp.	0	1.3
Curtiss-Caproni Corp.....	0	5-12
Curtiss-Robertson Airplane Mfg. Co. (new stock after present has been retired)	0	2
Keystone Aircraft Corp...½		1
New York Air Terminals, Inc.....	0	1
New York and Suburban Air Lines	0	2-5

The holders of Wright Aeronautical stock will receive additional inducements in the form of warrants.

Offers for an exchange will also be made to the Travel Air Manufacturing Company, and the Moth Aircraft Corp.

The consolidation will make this company the largest producer of airplane motors in the world, and the largest aviation company in America.

Mr. C. M. Keys will be President; Richard F. Hoyt, who is now Vice-President of Hayden Stone Company, and Chairman of Wright Aeronautical, will be Chairman of the Board of the new company.

It is to be noted that Curtiss Aero receives a greater number of the new company's shares than any other company entering the consolidation.

3. Bendix. This is a $140,000,000 combination of outstanding accessory units, in which General Motors has close to a quarter interest. The various units include Stromberg Carburetor, Bendix Brake, Eclipse Machine, Delco unit of General Motors, Scintilla Magneto, etc. It equips the aviation trade with brakes, carburetors, magnetos, starters, and other necessary accessories, and it will also continue its leadership in automobile accessories. This company has been unusually successful with both its production financing and merchandising problems.

There are outstanding 2,200,000 shares of stock. Stock is listed on the New York Exchange, and today's market, June 26, is 85, which is not out of line, according to reported earnings. Present dividend rate is $2.00. It is the commanding accessory company in the industry.

Net profits for the various constituent companies in 1928 were $6,166,045 as against $3,217,469 for the preceding year.

4. In the group of so-called investment trusts which are in most instances really investment holding corporations, the following five companies command consideration. The investor should choose *one* of the five to round out his list.

(a) North American Aviation is suggested because of the unusual financial influence and strength of its board of directors, and its large unrealized profits, and low market price of 17½. This stock has not moved with any degree of briskness, but has secured a wide distri-

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CURTISS FLYING SERVICE, INC.
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bution. It has already demonstrated earning power, and should reasonably secure its proportionate share of the major financing opportunities that will occur for a number of years. The salary account for the first quarter was only $7,667, which represents an unusually low overhead for a company handling so large a volume of capital.

(b) National Aviation enjoys to some extent an identity of directors and objectives with the North American Company. Without taking into account unrealized profits, which are said to approximate about $2,000,000, or ten dollars a share, the company earned for the last six months in 1928 $2.21 a share, and has now been credited with earning at the rate of about $5.00 a share for the first six months of this year. Such earnings should justify an early distribution of dividends, and we are advised that this matter has been informally discussed within a recent period. The recent abnormally high interest returns in both the time and call market are not now available to these investment companies, and they are therefore going in to the market and purchasing Aviation stocks that have shown attractively easier prices. This company has approximately 200,000 shares outstanding. It has been one of the most popular in the investment holding group. Today's market is 69.

(c) Aviation Securities includes on its board many of the names appearing on those of North American and National Aviation. Its unrealized profits are also understood to be in excess of $2,250,000. It is now listed on the New York Curb, and sells around 43½. Stock has sold as low as 33, and as high as 54, within the last three and one-half months.

(d) Aeronautical Industries, Inc. Earned $1.43 during the first four months of 1929, or at the rate of $4.29 for the year. As stock is selling between 21 and 23 a higher market can reasonably be expected. Within the last ninety days many capitalists and representatives of banking houses connected with the Curtiss-Keys group have become identified with and largely control this investment corporation. It has a broad diversified list of securities, and is traded in over the counter.

(e) Air Investors. Exhibits a balanced list of over 25 investments, in which manufacturing securities are 23%, transport companies 25%, motors and accessories 28%, and allied industries 18%. The preferred stock, selling between 36 and 38, is preferred up to $2.00, and participates with the common up to $3.00. It has voting powers and is convertible into two shares of common at any time up to redemption. There are 90,000 shares outstanding. Net income for the first quarter of 1929 was $138,311.00, not including unrealized profits on investments. This company not only invests in securities, but assists in organizing and promoting and financing sound new ventures, and has a technical staff to handle such work. Stock is quoted in the Boston Exchange.

5. National Air Transport. Issued its 20,000 shares at $100 a share. Stock is now selling, after accounting for the split-up of 20 for 1, on the basis of $760.00 a share, as the new stock is traded on the New York Exchange around $38.00. The company is said to be earning in excess of $100,000 monthly. It has a sound progressive management and connects New York and Chicago, the two largest cities of the Western hemisphere. It commands the premier transport territory of the world.

6. Western Air Express is now earning at the rate of a little under $13.00 a share. Stock is traded on the New York Curb at around $69.00 a share. This is unquestionably one of the leaders in earning power, and a much higher market price is justified. With Mr. Hanshue as its President it has enjoyed an exceptional development, and is rated as one of the best managed of the transport companies. Rights which

(Continued on page 59)

KINNEAR HANGAR DOORS

Cost . . . Future

THE price of an article is what might be called first cost. The cost of an article is the price plus the upkeep. It is the cost that everyone is interested in. All industries that are successful have learned by hard experience how to keep costs down, that is why they are successful.

It is estimated that American cities have spent more than a billion dollars in the last five years for improvements that would not have been necessary had more vision been employed in the planning. This money was spent for widening of streets, increasing sizes of sewers, making new boulevards, extending transportation systems, and other needed civic improvements.

Now comes the problem of the Airport. The Department of Commerce wants every municipality to have an Airport. Are the cities and small municipalities planning ahead, to the future, that future which takes in Air Transportation and its endless possibilities?

The experimental stage is past and those cities that want air transportation will have to provide adequate facilities and suitable buildings for aircraft. Better buildings will have to be built, and for better buildings, we are building Kinnear Hangar Doors.

Our doors are the result of years of experience in manufacturing. They are built to meet all aviation requirements and our engineering staff is at your disposal. We would like the opportunity of going into details with you.

The Kinnear Manufacturing Co.

MAKERS OF KINNEAR AUTOMATIC FIRE DOORS

General Offices: 9 Fields Ave., Columbus, Ohio

DISTRICT OFFICES IN

BOSTON 294 Washington St.
CLEVELAND 528 Union Bldg.
NEW YORK 342 Madison Ave.
CHICAGO 128 N. Wells St.
DETROIT 812 Ford Bldg.
PHILADELPHIA 503 Wesley Bldg.
CINCINNATI 528 Walnut St.
NEW ORLEANS 730 Hibernia Bk. Bldg.
PITTSBURGH 617 Oliver Bldg.
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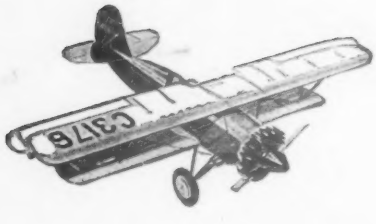
WASHINGTON, D. C. 1135 Investment Bldg.

KINNEAR ROLLING · DOORS

A THOUSAND WHY IT SHOULD BE TRAVEL AIR



On March 30, 1929, there were in the United States 5030 registered or identified airplanes, according to a bulletin on the distribution of aircraft issued by the Aeronautical Chamber of Commerce. Of this number, 1389 represent miscellaneous or war surplus equipment.

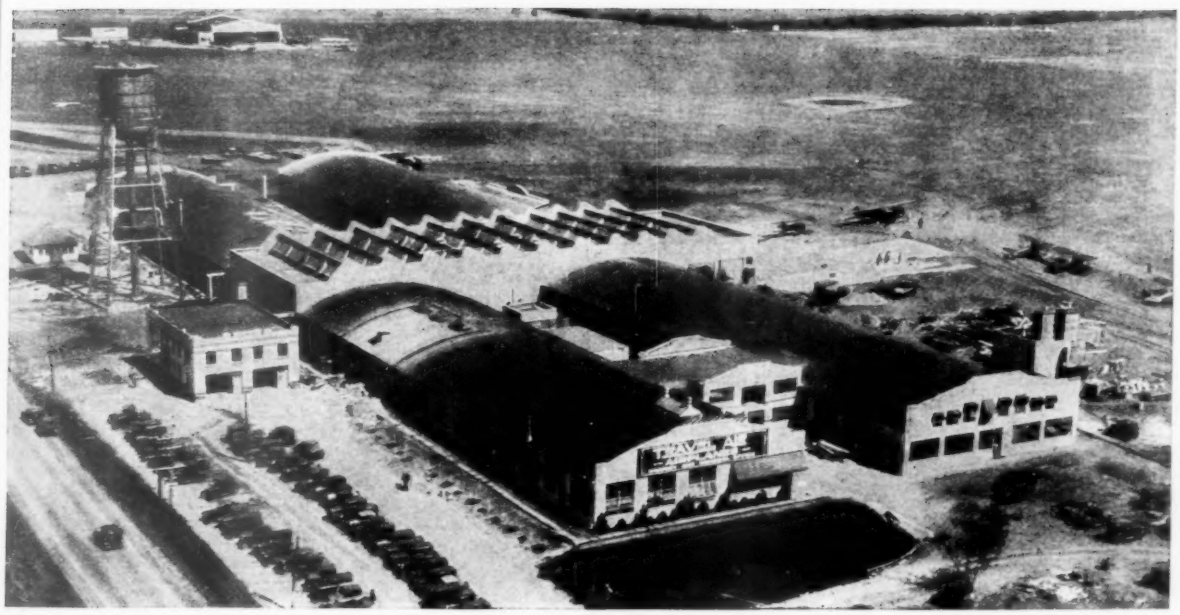
On the same date, March 30, 1929, the Travel Air Co. had produced and delivered over 1000 Travel Airs. Thus one company, manufacturing planes ONLY for training, sport, light transport, and personal business, had produced one-sixth of the total of all kinds. Eliminating the 1389 miscellaneous or war surplus, Travel Air had produced approximately one-fourth of the total.

The reasons for the overwhelming preference for Travel Air are found in their performance with dependability; inherent stability in flight, irrespective of weather conditions; strict adherence to proven principles of design; exacting manufacturing standards; enormous production facilities; ample finance; and a 100% service policy.

THE STANDARD OF AIRCRAFT COMPARISON

REASONS AND MORE

The new Travel Air factory consists of five units with a floor space of 116,000 feet filled with the most modern machinery and equipment. Line assembly is maintained in all departments—a thorough inspection system is in force and finally each Travel Air plane is thoroughly flight tested before delivery is made. Approximately 600 workmen are now employed. Night and day shifts are maintained. Visitors are welcome and are invited to follow a Travel Air plane from fuselage welding to final assembly.



TRAVEL AIR COMPANY

WICHITA, KANSAS

Send for The Story of Travel Air (new edition) free on request — illustrates and describes three types of dual control cabin monoplanes and eight types of open cockpit 3 place biplanes—also takes you through the Travel Air factory with illustrations and full description of manufacturing processes.

THE RIGHT WAY TO START IN AVIATION

Member of Byrd Antarctic Expedition

MR. E. J. DEMAS

Mr. Demas, a graduate of the American School of Aviation, offers living proof of what "the right start" means in Aviation. He was selected by Commander Byrd as a member of the epoch-making Antarctic Expedition. Mr. Demas tells us he considers us responsible for his good fortune. This is a typical case of a young man who recognized his opportunity and studied to make the most of it. Don't *envy* a man like this; follow *his example*.

Few fields of activity offer men the opportunity to reach the heights of prominence as does flying. Few professions, similarly, offer as much in the way of promotion and salary to trained capable men.

Only men, however, of proved capability and good training make any real success in Aviation. In this great new profession the main question is one of the right start—a question of learning fundamentals thoroughly. Now, through the oldest home-study Aviation School in America, that *right start* can be yours.

While the American School of Aviation's Home Study Course does not teach actual flying, it offers the man who wants to be a Pilot exactly what he needs first, as his preliminary training before going to a flying school to secure his Pilot License in less time, but also with less danger of mishap—for he understands thoroughly before he reaches the Flying Field for Flying Lessons, the laws of gravitation, air-resistance, methods of retaining equilibrium, stability and balance, the principal stresses that act on an airplane in flight, compass error, the science of aerography, the use of the barometer, airplane designing, construction, repairs, and hundreds of other important phases of aviation, essential to successful flying.

Flying Schools know from experience that a man who has a complete knowledge of the principles of flight and airplane construction, as taught by the American School of Aviation, is a more apt pupil, than the man who has no such training. They know that he will learn much more quickly and will require less instruction before he can make his first flight alone.

To those interested in qualifying for a ground job, the American School of Aviation Home Study Course also offers a most thorough training in all branches of Aviation—a training that should lead to well-paying positions. For twelve years hundreds of ambitious men have secured the right start in Aviation through the basic fundamental training of this pioneer school—the oldest school of its kind in the country.

Aviation Booklet Free Upon Request

We offer to send free to those who are earnestly interested in getting the right start in Aviation a copy of an interesting booklet, *Opportunities in the Airplane Industry*. It is intended for men who realize the importance of the right kind of training and the right kind of start in order to get somewhere in the Aviation Industry.

Are you this type of man? If you are, then send the coupon. Your copy of this free booklet, together with complete information will be sent to you promptly.

AMERICAN SCHOOL OF AVIATION, Dept. 146-C, 3601 Michigan Ave., Chicago, Ill.

Without obligation, send me your free booklet, *Opportunities in the Airplane Industry*, and information about your Home Study Course in Practical Aviation.

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Dept. 146-C 3601 Michigan Ave. Chicago, Ill.

Investment Possibilities

(Continued from page 55)

permit purchasing new common at the rate of $45.00 a share for each four shares held are now commanding $6.50 a right on the New York Curb. The company has operated on a highly satisfactory mail carrying rate, between Salt Lake City and Los Angeles. This $3.00 rate will be reduced—but increased volume of business will about maintain the present income return. The company is now extending its operations to cover the territory between Los Angeles and Kansas City. Western Air Express is reported to have made profits within two months of its inception.

Instead of future transport companies continuing to only exploit the United States, which in many instances will mean the establishment of competing lines, the suggestion has been made that China offers a very fertile field for this branch of the industry. For instance, to go from Hankow to Chengtu, Szechwan, now requires thirty days' travel by motor. The trip could be made in 12 hours by airplane. Outside of the water routes in China there are less than 2,000 miles of motor highways. Such activities as the transportation of musk, which is very light in weight, offer an inducement for commercial transport. Another opportunity is connected with the transportation of wax insect eggs from Yunnan province to the Mt. Omi region. Insect eggs can only be propagated in the Yunnan region, and it takes three weeks' time to transport them to Mt. Omi. The time could be cut to less than one day. Here is food for thought for the adventuresome-minded, looking for new fields to enter.

It is reported that only nine air transport companies made money during the last six months of 1928, while 10 reported a deficit. Reports of the Department of Commerce showed a total income of $3,238,057 from the nine companies above mentioned, and their planes flew 2,373,165 miles at an average cost of 69.4 cents a mile. At present there are over 40 air transport companies in the United States, but many of them were reluctant to answer the Government's questions as to earnings, and expectations.

To summarize. If an intending investor will select one of the five investment holding corporations out of Section Four, keeping in mind that almost all of these companies have options on various stocks at prices very much under their present market levels, which eventually will represent substantial profits, and take the other five above mentioned securities for a *long pull*, we believe that he will have a combination of peace of mind, satisfactory return on his investment, and an attractive market appreciation that will match well with any other securities that he can select. If he is looking for a short turn he had better make his own selection.

There are other opportunities where earnings are substantial, and the amount of stock issued is exceedingly small, which involve strong possibilities of split-ups, and consequently sharp market advances. Stearman, for instance, has just split up its stock on a five for one basis, and stock has had a good advance in the last three or four weeks. Expectations of a split-up in Command Aire, with only 6,000 shares, are justifiable.

Competition in the middle and low priced planes is expected to be severe in the next eighteen months, with an overproduction already suggested, therefore an extreme amount of caution must be exercised in getting into this class of investments.

Air Service Views of Congressmen

(Continued from page 20)

of Wichita calls herself the air capital of the West. Airports dot the state. These facts prompted the writer to elicit the ideas of Senator Arthur Capper as a contribution to the Congressional viewpoint on American aviation. The Kansas Senator advanced an interesting theory about airplanes and city-building.

"Since the dawn of civilization," he said, "cities have been built on navigable water—sea harbors, lakes and great rivers. The coming of railroads gave impetus to cities thus established. The result is great cities where buildings are piled high and people are crushed together in mobs. That's bad for the healthy and wholesome development of the human race.

"But see what air transportation is bringing. The great open plains of the west are an invitation to air travel. The greater distances to be traveled give added value to the airplane. Kansas is making the most of the opportunity. She is losing no time in building modern airports. Kansas young men are crowding into the flying schools. In the city of Wichita the manufacture of airplanes is rapidly becoming one of the leading industries. It will not be long until regular air lines will operate in and across the state in all directions.

"Wichita may very well become the hub of many such lines. Air traffic from all parts of the continent and even beyond in time may center in a metropolis out on the plains, away from great bodies of water. It will be an interesting experiment. In the meantime our people are making the most of it.

"Naturally, I have a great interest in this development. I want to see aviation grow and grow soundly. If I sense the attitude of Congress correctly it is that every proper effort shall be made to promote aeronautics in America. The upbuilding of the air service of the Army and Navy is, of course, a direct responsibility of Congress. We are determined to do the best we know how to do in that direction. Some mistakes have been made as might have been expected in plunging into so new a thing as aviation. But we are making progress—great progress. Give us a little time and we shall have nothing to fear with respect to our national air defense.

"In all our plans for national defense great importance is given to civilian aeronautics. That is why air mail contracts on a liberal pay basis have been authorized. That is why we must train reserve officers and men for military air services. Reasonable and well planned government measures will be continued with assurance that eventually we shall have a thriving, self-sustaining, civilian aeronautical industry from which we can draw all needed reserves to meet any emergency that may arise.

"It is a matter of great satisfaction to me to see our state of Kansas taking such an active part in this new industry. Perhaps I shall live to see cities built on pasture lands and wheat fields—built by the great volume of air traffic that flows as the crow flies and can scorn the topography which heretofore has made great cities grow only where water and rails meet."

Aerodynamics

By Professor Alexander Klemin

(Illustrations by the author)

Daniel Guggenheim School of Aeronautics, New York University
and leading American authority on this subject

Article 10
Landing and Landing Run

IN Article 7 of this series, we have already discussed the problem of coming into a small field, either by recovery from a steep dive, or by a stalled glide. A normal landing into a field of small dimensions depends on the same principles, which it is interesting to discuss a little more in detail.

Suppose the pilot is flying the hypothetical machine of Article 7, and gliding at 6 degrees incidence, 4° 24′ to the horizontal and at a speed of 61 miles per hour. The glide path is very flat as indicated by the sketch of Figure 1.

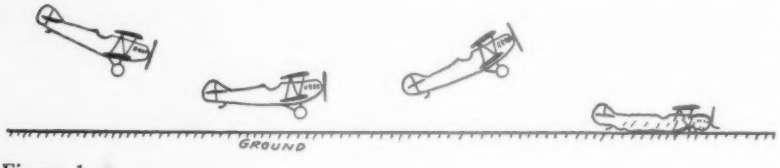


Figure 1

SUDDEN STALLING AND "PANCAKING"

Suppose that the plane has very powerful elevator control and is short-coupled, having all its weights bunched close together about the center of gravity. Suppose that just before landing, the pilot pulls back very hard on the stick. Such a plane will respond very quickly to the controls, and the angle of incidence to the glide path will be rapidly increased without much loss in speed. Let us suppose further that the machine is brought to the angle of incidence corresponding to maximum lift without *any* loss of speed.

The area of our hypothetical machine was 200 square feet, the wing section was Clark Y, the weight 1600 pounds. The maximum Ky at 14 degrees incidence for this wing is .0033. The lift at 61 m. p. h. and this Ky will be

$$.0033 \times 200 \times 61^2 = 2460 \text{ pounds}$$

or some 54.5% more than the total weight of the plane.

If the lift is greater than the weight, the machine will evidently ascend, or "bounce" in flying vernacular.

Of course no plane is maneuverable enough to change its flight attitude instantaneously. But too rapid a flattening out process just near the ground always leads the student into difficulties.

After the "bounce" the plane will probably "stall" a few feet from the ground, then drop and hit the ground with some degree of shock, a process called "pancaking."

Sometimes after the "bounce" there may be enough speed left to nose the plane down again and then make a second and better landing. Or, if the engine is running, it may be better to "give her the gun," that is, open up the throttle and fly off to attempt a second landing subsequently.

A Perfect Three Point Landing

There is nothing which attracts so much admiration as a perfect three point landing. The pilot making such a landing continues his normal glide until the wheels are about 10 feet off the ground. (It requires much practice to gauge this height.) Then he will pull back gently on the stick, flattening out the path, increasing the angle of incidence and losing speed gradually, until the plane is "stalled" at about 2 feet above the ground. He will then be flying almost parallel to the ground, and the front wheels and the tail skid will touch the ground at the same instant, without any perceptible shock. The process is illustrated in Figure 2.

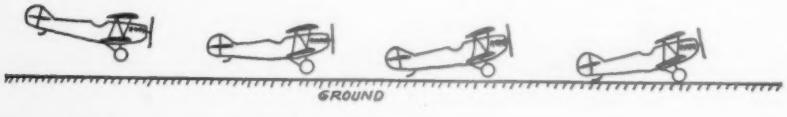


Figure 2

THREE POINT LANDING

The student may flatten out gradually, but misjudge his distance and stall several feet above the ground. He will then pancake badly and perhaps damage the undercarriage.

Not flattening out in time is perhaps a worse fault. The plane is then landing nose slightly down, and as the wheels strike the ground, there is a tendency to nose over as illustrated in Figure 3.

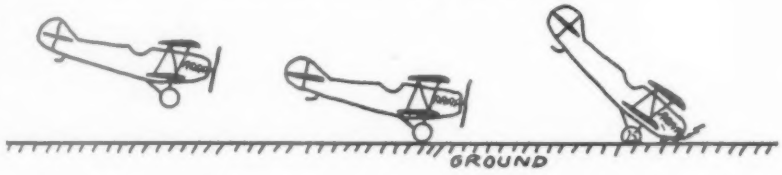


Figure 3

TAIL HIGH LANDING - NOSE OVER

The Advantage of Slow Landing

The advantages of slow landing are obvious. The kinetic energy as we know varies as V^2. Therefore a plane landing slowly has less kinetic energy to be destroyed by air drag and ground friction, and the length of roll will be less. If an obstacle strikes the front wheels the dangers of damage to the undercarriage and of turning over are far less. Since landing speed $V = \frac{W}{Ky\ max \times A}$ that machine will have the slowest landing speed, which has

(1) the lowest loading in pounds per square foot of wing area, $\frac{W}{A}$

(2) the highest value of Ky max for the wing.

Commercial airplanes of today run rather high in loadings per square foot, with values going up as high as 14 pounds per square foot for large machines, and values well over 10 pounds per square

. . . but think what you get at PARKS

It is one of the finest air colleges in the world . . . elaborate buildings* . . . complete equipment . . . located on a metropolitan airport, twenty minutes from the heart of a great air city.

50 . . . 150 . . . 1,050 students continue to pour into Parks, believing in its superiority and finding there all that they expected . . . and more.

The student at Parks lives in royal comfort. Parks Hall is a large modern dormitory that holds the luxury of a palace with the feeling of home. Here is elysium, where self-respect takes on a swagger . . . comfortable lounge . . . club rooms . . . bed rooms . . . showers . . . barber shop . . . dining rooms . . . recreation rooms . . . yes, and tennis courts.

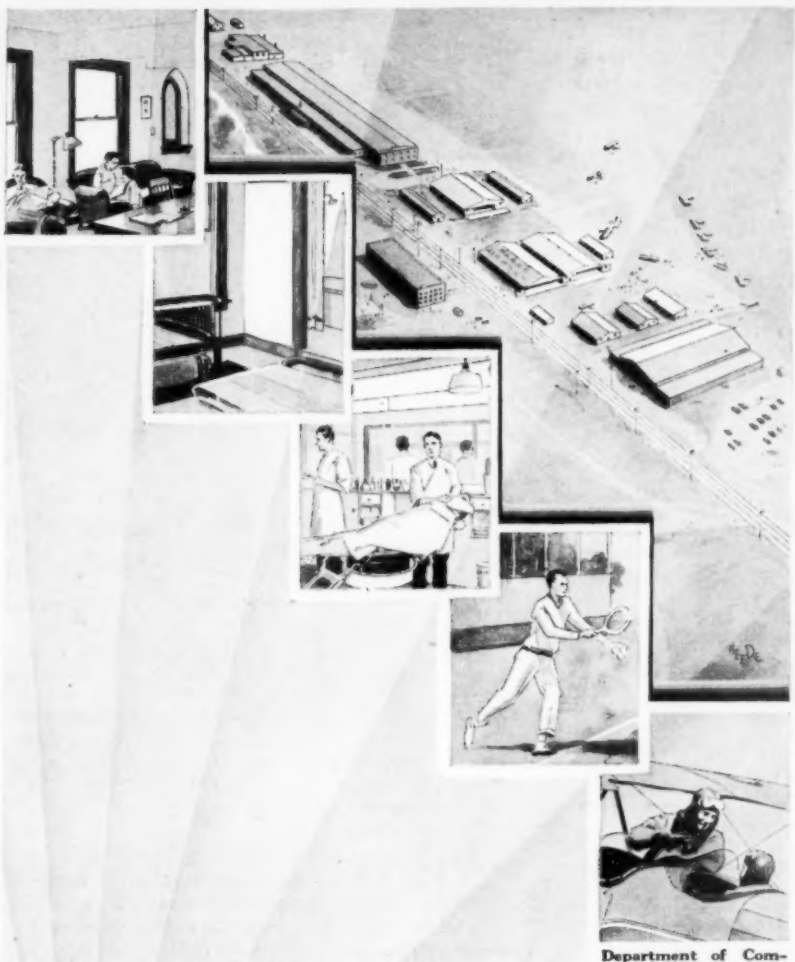
This is just one of the things that make Parks worth while. There are many others.

You should not trust your career . . . your whole future as a successful airman . . . to any method of instruction or to any institution that is not the very finest. It isn't worth the gamble.

At Parks you are guided, coerced, cautioned, and disciplined always. You follow a regular curriculum of study with thoroughness as the keynote.

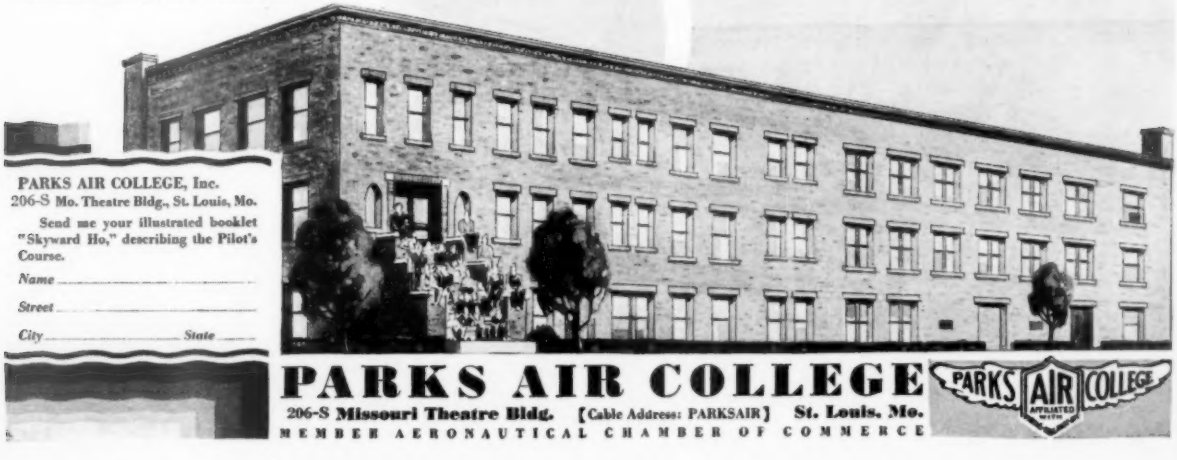
Let us send you our illustrated book free.

Fill out the coupon NOW.



Department of Commerce inspection of Parks Air College completed on June 15th.

*Parks Air College has a corps of 54 instructors, 14 buildings with a floor space of 75,000 square feet and a total investment of more than $400,000.00.



PARKS AIR COLLEGE, Inc.
206-S Mo. Theatre Bldg., St. Louis, Mo.

Send me your illustrated booklet "Skyward Ho," describing the Pilot's Course.

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PARKS AIR COLLEGE

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MEMBER AERONAUTICAL CHAMBER OF COMMERCE

PARKS AIR COLLEGE AFFILIATED WITH

foot for single engined cabin planes. This is because low loading per square foot means a relatively large wing area and low maximum speeds. Since speed is the very essence of airplane utility, extremely low wing loadings cannot be tolerated.

There is not much to be gained either from using wings of high maximum Ky. The range for practicable airfoils is narrow, say .003 to .0036 for Ky max. There are heavily cambered wings which have values even higher than this, but they are very inefficient at high, or cruising speed.

One of the real problems of modern airplane design is to keep increasing the top speed, while maintaining the landing speed within reasonable limits. Perhaps two or three thousand airfoils have already been designed and tested and there is not much further progress in the wing alone to be expected. Designers will be forced to employ sooner or later lift increasing devices such as the Handley Page slot, flaps at the rear of the wing, etc., which we hope to discuss in a later article.

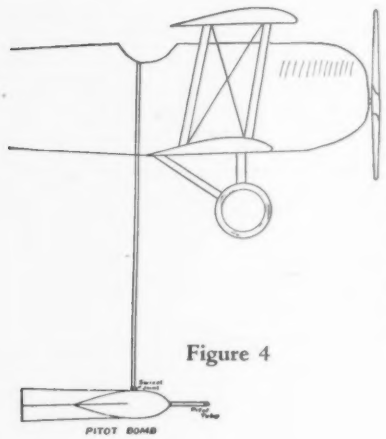


Figure 4

Misleading Advertising of Landing Speeds

It is quite difficult to measure landing speeds exactly. Mechanical methods have been tried in which by means of electrical contacts and a revolving recording drum the number of revolutions of the wheel from the instant of touching the ground to the instant when the wheels cease revolving were registered. These methods are somewhat complicated, and also take no account of the effect of the wind. The usual combination of pitot tube and airspeed indicator is very unreliable at landing because the air flow is disturbed by the wing at high incidence, and possibly by the proximity of the ground. Also it is difficult to get an instantaneous reading and to be quite sure that this reading coincides with the instant of landing. The only definite measurement that can be made reliably is that of the minimum speed on the glide, which can be made by suspending a pitot bomb some forty feet below the airplane as shown in Figure 4. Suspended in this manner the pitot is free of interferences and gives reliable readings.

Owing to this difficulty in measuring landing speeds, and due to the natural desire of manufacturers to have as low a landing speed as possible, advertisements of landing speed are often somewhat misleading. It should also be noted that in the hands of a highly skilled pilot, and in a plane equipped with a good landing gear, the landing speed can be made to appear lower than it legitimately should be. The pilot who really knows his craft can stall the machine three or four feet above the ground, bring the wing above the maximum lift coefficient where its drag is so large as to kill the speed, then land with the tail skid touching an instant or so before the wheels. Such a landing puts an undesirable strain on the plane, but will help to give the impression of a slow landing, and a short landing run.

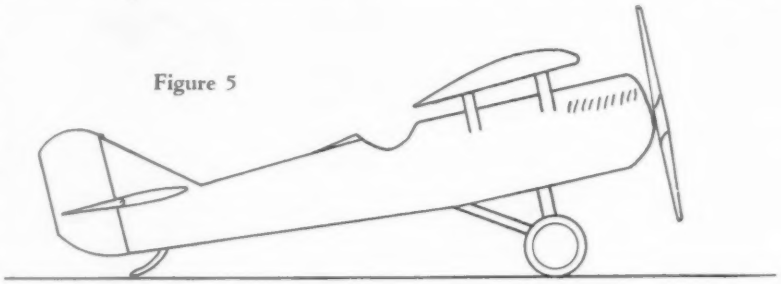


Figure 5

AIRPLANE AT THREE POINT ATTITUDE

Landing Fast

We have been emphasizing the value of slow landings as likely to minimize the shock, and as certain to shorten the landing run. Yet there are conditions when a pilot will prefer to make a fast landing with the propeller axis almost horizontal, then bringing the tail down gradually until the skid touches the ground. He will prefer to come in fast when the air is so gusty that it is hard to keep the plane on an even keel. Coming in fast, however, gives rise to the danger of "overshooting" unless there is a strong headwind. Also unless the field is very smooth there may be severe bouncing in the fast landing.

Factors Entering into Length of Landing Run

The mathematical expression for the length of the landing run is too complicated in expression and derivation to be discussed in these introductory articles.

The length of run increases with the square of the landing speed because the kinetic energy of the plane varies as the square of the speed. Therefore, a plane lightly loaded per square foot of wing area should come to rest quickly. It is a fallacy to say that a large machine needs more space for its run than a small machine. They need the same length of run if they carry the same wing loading. It just happens that with smaller airplanes designers use lower wing loadings as a rule. This is because small airplanes of the sport type may be required by their owners to alight in any restricted field, whereas the large transport planes operate only from large airports, and are less liable to emergency landings because they are equipped with three engines.

Another important factor in the length of the landing run is the L/D of the plane in its three-point landing attitude. At the instant of landing it is advisable to have the wing at its angle of maximum lift, so as to give the slowest possible speed. In the practical design of the airplane, it is therefore important to have the chassis of such length that the wing is indeed at a high angle when the airplane is in the three-point attitude as shown in Figure 5. If this angle can be made a little bigger still, then in the landing run the wing will be very inefficient aerodynamically and will serve as an air brake.

Of course the ground friction affects the length of the run. But the maximum ground friction ever found is only one-tenth of the weight of the airplane and is not as important a factor as might be imagined.

Many suggestions have been made by inventors and designers for air brakes, in the form of flaps hinged at the sides of the fuselages, etc. It may be safely said that such air brakes are likely to be clumsy and ineffective, and that wheel brakes which lock the wheels on landing are far better and more powerful in action than the braking action of the wing itself.

Machines of the future provided with lift increasing devices and with wheel

ART GOEBEL

WORLD FAMOUS FLIER IS NOW TEACHING AVIATION

COLONEL Arthur C. Goebel, winner of the $25,000 James Dole race from California to Hawaii; holder of the Transcontinental Air Record from Los Angeles to New York; winner of countless other aviation events; acclaimed the greatest "stunt" flier who ever flew a ship and recognized by his fellow aviators as one of the greatest pilots in the world, has organized and is now personally teaching aviation in his own school, The Art Goebel School of Flying, in Kansas City, "The Heart and The Hub of Aviation".

The Goebel School is organized and conducted upon the same thorough and efficient basis as is used by the United States government in training student fliers for the Army Air Corps. Text books, shop and laboratory equipment, instructions, training planes and every feature of the Goebel school are based on government standards and rigidly meet every requirement of the Aeronautics Division of the United States Department of Commerce.

Army officers on leaves of absence are in charge of the important departments of the school. Other departments are in charge of aviators, personally selected by Colonel Goebel from the wide circle of friends he has made in his more than seven years of practical aviation. Each man is an outstanding specialist in his particular field and has been chosen for his personal qualifications to instruct as well as his practical knowledge of aviation.

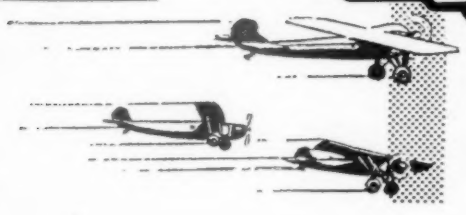
The Goebel School is located on the Municipal Airport, only 5 minutes ride from the heart of the business district of Kansas City. The Goebel Flying Field is privately owned and is located 2½ miles north of the school building, hangars, shops and dormitories.

Colonel Goebel is personally in charge of the school. Associated with him are a group of the best known business men and civic leaders of Kansas City. Everything connected with the school is modern, up-to-the-minute and the best money can buy, as well as being personally selected by Colonel Goebel whose many years as a successful aviator have given him an unusual knowledge of the proper training equipment necessary to teach aviation.

Let Art Goebel teach you to fly—learn aviation under the personal direction of an aviator who has earned a world-wide reputation as a flier—and then step right into aviation yourself—the world's most fascinating, interesting and best paying industry—an industry whose greatest need is trained men.

Aviation needs you—wants you—and is willing to pay you more for your services than you can earn in any other industry to start with—an industry which is seeking high salaried executives which must come up through the ranks of trained pilots—opportunity is calling you—get started in aviation today by sending in the attached coupon.

Examination and rating by the Department of Commerce applied for.



Colonel Arthur C. Goebel
154 West 12th St., Kansas City, Mo.

Dear Colonel Goebel: Without any obligation on my part, please send me additional information regarding The Art Goebel School of Flying.

*Name*_____ *Age*_____

*Address*_____

*City*_____ *State*_____

brakes may be expected to come to rest in about 100 feet or even less.

How Brakes Affect the Design of an Airplane

In every airplane it will be found that the center of gravity is some distance behind the wheel axle. When an airplane is landing, the ground friction acting at the surface of the wheels is equal and opposite to the inertia force at the center of gravity produced by the deceleration

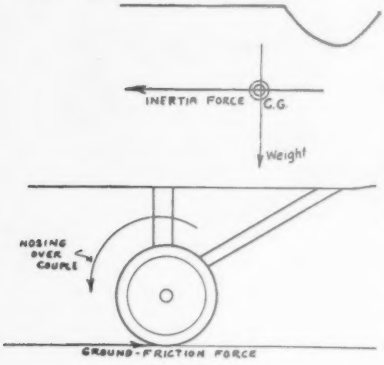


Figure 6

or slowing down of the airplane. These two forces produce a nosing over couple as illustrated in Figure 6. But if the center of gravity of the airplane is behind the wheel center, then an opposing couple about the wheel base is produced by gravity. For design purposes there is a very useful rule to fix the position of the wheels, with the propeller axis horizontal, between the line joining the center of gravity and the wheel axle, and the vertical through the wheel axle must not be less than 12 degrees and no bigger than 17 degrees (see Figure 7).

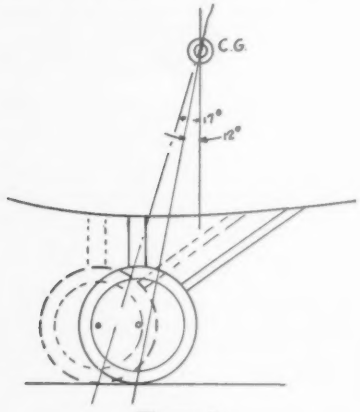
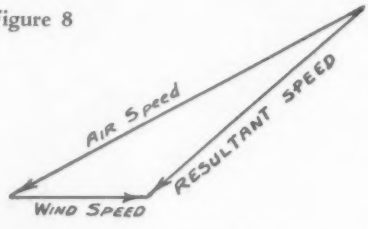


Figure 7

With unbraked wheels, the coefficient of ground friction is rarely greater than 10 percent; (for example, if a plane weighs 2,000 pounds, the ground friction force will be 200 pounds). With the application of brakes, and wheels locked, the coefficient of ground friction may be as high as 55 percent. Therefore, the friction force, the deceleration, and also the nosing over couple are much greater with the application of the brakes. When brakes are used, the wheel axle is therefore placed a good deal further ahead, and the angle mentioned in the preceding paragraph is likely to be 25 degrees rather than 12 or 17 degrees.

Figure 8



GLIDING AGAINST THE WIND

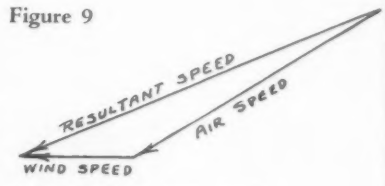
Unfortunately with the center of gravity further back relatively to the wheel center, a greater proportion of the load is carried on the tail skid. This in turn means that it is somewhat harder to raise the tail at the take-off. Also with a heavier tail load in taxying the surface of the airdrome is apt to suffer from the tail skid shoe. These difficulties do not seem to be insurmountable, but where front wheel brakes are employed, a tail wheel instead of the conventional tail skid seems advisable.

Effects of Wind

One of the first things a student pilot learns is always to land into the wind and to check the direction of the wind from the wind cone or "sock" when approaching a field. The reasons for this rule are obvious.

The pilot cannot tell the direction of a steady wind without some external reference point to go by. The plane becomes part and parcel of the atmosphere. Nevertheless, the speed relative to the earth is compounded of the wind velocity and the air speed of the airplane. Gliding against the wind, the plane will at a given angle of incidence and a given air speed glide more steeply relative to the earth. This is illustrated by the diagram of Figure 8, where the two velocities are compounded geometrically.

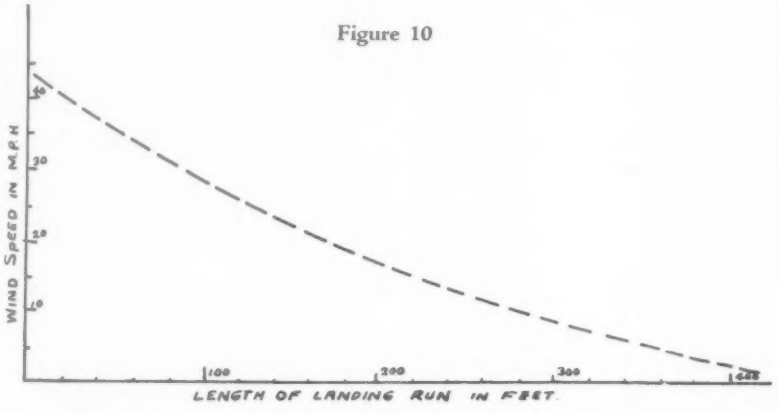
Figure 9



GLIDING WITH THE WIND

When gliding with the wind, a lesser horizontal distance is covered for a given loss of altitude as illustrated by Figure 9. Therefore, it is more difficult to glide into a field flying with the wind.

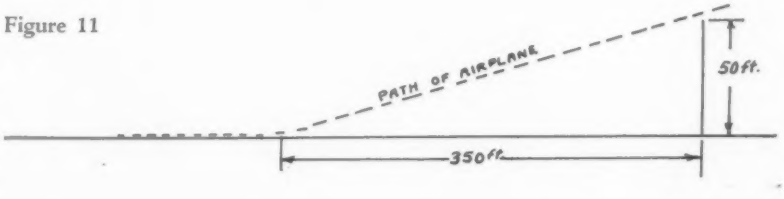
Figure 10



Again, when landing against the wind, the speed relative to the ground is less and the danger of damage to the undercarriage is lessened.

Again, when landing against the wind, the length of the landing run is reduced. In fact, if the wind speed is exactly equal to the landing speed, the plane will

Figure 11



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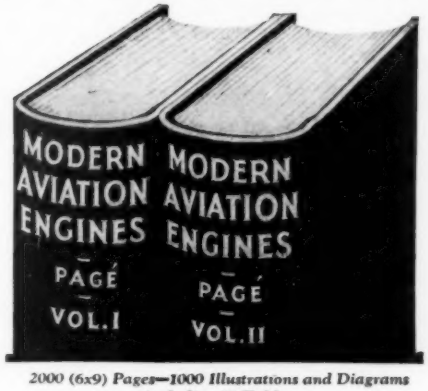

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come to rest where it first touches the ground. The way in which the landing run is reduced by a head wind depends on the design of the plane the coefficient of ground friction, etc. Figure 10 shows a typical instance of how the landing run is reduced by head winds of various intensities.

Why a Field with Obstacles at the Boundary Has to Be Larger

The effective length of a field runway is reduced by an obstacle of some height at the boundary. If there is no obstacle, the pilot can start his landing glide well ahead of the field and land at the very boundary. When there is an obstacle of say 50 feet, and with a glide of 1 in 7, he can only land $50 \times 7 = 350$ feet from the boundary as illustrated in Figure 11. An effective decrease of runway is calculated in this fashion by the Department of Commerce in rating airports.

Questions

1. The hypothetical machine of Article 7 is gliding at an incidence of 1 degree. What is the L/D of the plane at this incidence? What is the air speed? What is the angle of the glide path with the horizontal?

2. If the pilot could suddenly change the incidence to that of maximum Ky just before touching the ground, what would be the lift of the wings at this instant?

3. A manufacturer advertises a monoplane weighing 2,600 pounds, and having a wing area of 200 square feet as having a landing speed of 35 miles an hour. How far off is he likely to be?

4. A student lands a machine without flattening out from a glide of 6 degrees to the horizontal, the air speed being 80 miles an hour. What will be the vertical velocity on striking the ground?

5. A plane is gliding at 70 miles per hour, on a glide path of 1 in 7. There is a horizontal tail wind of 20 miles per hour. What will be the steepness of the glide relative to the ground?

6. A field has a row of trees at its boundary, 50 feet high. The hypothetical machine of Article 7 is gliding over this obstacle at its best angle of glide. Its landing run is 300 feet. How far from the base of the trees will it land?

And Now—The Diesel

(Continued from page 28)

L. M. Woolson, chief designer of the engine, hopped off with W. E. Lees, pilot, for Langley field. The flight from Detroit to the field required approximately seven hours and was made at an average speed of 85 miles an hour. The distance flown totalled 685 miles, due to the particular course followed by Pilot Lees.

Upon their arrival, Woolson sent the following wire:

> "Arrived after six hours and fifty minutes' uneventful flight, consuming $4.68 worth of furnace oil."

As the fuel oil the Diesel burns costs 8.7 cents per gallon, Woolson's consumption of $4.68 worth equals 54 gallons. A 200-horsepower gas engine, burning aviation gasoline which costs about 30 cents per gallon, would consume 13 gallons per hour, or 78 gallons in six hours, at a cost of $23.40.

On his departure from Detroit, Woolson carried more than 100 gallons of oil, sufficient for his return without refueling. The fact that he could take the plane such a distance without special rigging for starting dispels the rumors which have claimed that the problem of starting a high compression engine such as the Diesel was one that could only be met with special equipment.

Although the Diesel weighs more than gasoline engines of equal horsepower, estimated at three pounds per horsepower as compared to two pounds per horsepower, the difference is more than compensated by the disparity in weight of required fuel loads. There are nine cylinders in the Packard Diesel which operate independently of each other, giving the effect of nine different engines.

Another advantage will be lack of radio interference while a plane is communicating with the ground, since the construction of the engines requires no electrical apparatus for ignition purposes. Carburetion points are eliminated, greatly reducing the fire hazard.

According to Packard officials the choice of airplane equipment for test purposes on the new Diesel engine reached around several types of plane. Final choice of Stinson equipment resulted from their ability to carry the heaviest loads with full dependability and low horsepower engine rating.

Besides being used for exclusive tests on the Diesel engine, Stinson planes are also being used by the Continental Motors Corporation of Detroit, the Warner Aircraft Company and on the new series of Lycoming engines now being tested by the Auburn Motor Company of Auburn, Indiana.

Picked Up in the Hangars

(Continued from page 29)

jury I suffered was some bruises and contusions, from which I am now completely recovered. I declined to enter an ambulance, but took another taxicab and went to our office.

"The following day I started back home by train. As our train was pulling out of the station in St. Louis a freight train backed out of a siding, crashed into our observation car, knocking it off the track. Fortunately, I again was uninjured. The observation car was uncoupled from the rest of the train, and after a considerable delay we proceeded on our way to New York.

"For the sake of safety I would recommend that hereafter all trips possible be made by airplane."

How Simple Aviation Is!

Here is what various persons have told W. J. Powers, service shop foreman at the Fairchild Aviation Corporation's plant at Farmingdale, Long Island, that certain aviation terms mean. At least, Powers says they told him.

BASSWOOD: Wood used on seaplanes.

BELLCRANK: The thing you turn to let the pilot know you are ready to start.

CONTROL STICK: The lever they use when the steering apparatus gets stuck.

DOPE: Advice given by the pilot.

FLAP: A piece of the wings that flutters when the plane is falling.

FUSELAGE: The airplane's insides.

PROPELLER: The whirligig in front of the motor that makes a loud hum to let the passengers know the airplane is moving.

RIBS: The sticks to keep the covering wrapped around the outside.

RUDDER: The part of the tail used for steering when the plane falls into the water.

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Ray Kutterer, a Universal student who now holds a responsible position with the Universal Aviation Corporation.

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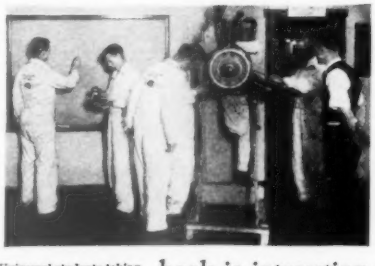

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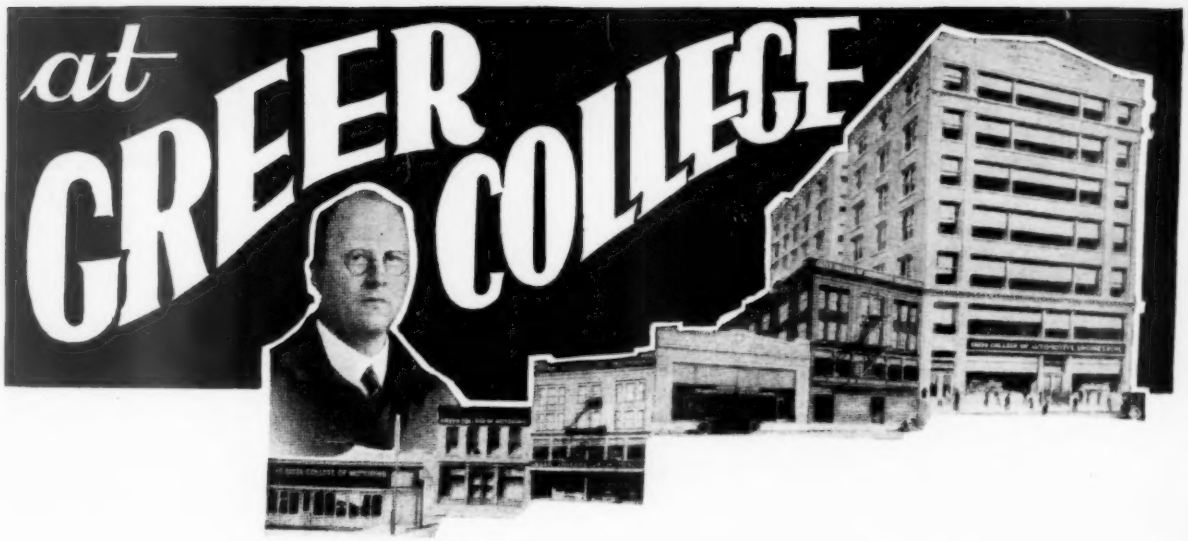

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With the Industry

(Continued from page 46)

district and the Monterey peninsula. This is said to be the first regular shuttle service to be inaugurated in the West.

Mile Square Airport Taken Over

The United States Air Transport of Washington, D. C., has taken over the operation of the Mile Square Airport two and one-half miles south of Alexandria, Va. Development of all facilities is planned.

Great Lakes Has Factory Course

The Great Lakes Aircraft Corporation of Cleveland has inaugurated a series of training courses for office and shop supervisors, including foremen and subforemen, and others. A complete system of vocational training will eventually be worked out.

Business Reply Cards by Air

The Post Office Department has issued a ruling that now permits the use of air mail for business reply cards. The receiving company pays but one cent over the regular five cent cost for the return of the card.

Northwest Opens Shuttle Service

Northwest Airways has opened a shuttle service between the Municipal Airport, Chicago, and the lake front, which is within five minutes of the loop business district.

Barling Breaks Altitude Record

A Barling NB-3, using a Fairchild "Genet" 80 horsepower motor, has broken the world's altitude record for light planes. Pilot Barney Zimmerly attained 25,000 feet in the Barling, breaking the 22,500 foot mark of Paul Baumer of Germany, and the record of 19,862 feet of Captain DeHavilland of England for planes weighing less than 881 pounds, empty.

Monthly Financial Review

(Continued from page 19)

Company, which will have an authorized capital of 200,000 shares of no par Common Stock, of which 120,000 shares will be outstanding.

The Aviation Corporation has purchased Interstate Air Lines, hitherto a subsidiary of the United Aviation Corporation, through an exchange of stock. The Interstate Company operates an air-mail route under contract No. 30 between Chicago and Atlanta, St. Louis and Louisville.

Bendix-Cowdrey Brake Tester, Inc., has been formed to take over the business of the Cowdrey Brake Tester Organization, Inc., and will become a subsidiary of the Bendix Aviation Corporation.

Stockholders of Maddux Air Lines Company have approved the proposal to exchange their stock for that of the Transcontinental Air Transport, Inc., in the ratio of two shares of Maddux for one of T. A. T. This is an important acquisition for Transcontinental and should also be of valuable assistance to Maddux.

Miscellaneous Financial Items.—50,000 shares of the no par Common Stock of the Atlantic Seaboard Airways, Inc., are being offered to the public by Chas. S. Rodd, Inc. This company operates airports and various flying services in and about Washington, D. C.

Armstrong & Co. of New York are offering 50,000 shares of Atlantic Air Service, Inc., Class A Stock. The company has an authorized capitalization of 100,000 shares of Class A Stock, of which 50,000 shares will presently be outstanding. There are also 20,000 shares of Class B Stock, all of which are outstanding.

The Class A Stock is preferred as to dividends at the rate of $1 per share and shares equally with the Class B Stock after the latter has received $1.

The company operates a 75 acre airport at Westfield, N. J., and has a contract with the Holland-American Line to carry incoming passengers to inland destinations.

On June 19th, a special meeting of the stockholders of the Packard Motor Car Company will be held to pass on the recommendation of the Board of Directors to change the capital stock from the present par value of $10 to stock of no par value and to exchange five shares of the new stock for each one of the present shares. The Board declared an extra cash dividend of $1.50 per share on the old shares payable in July to stockholders of record July 12th.

Westchester Airport Corporation, formerly Barrett Airways, Inc., is offering 33,000 shares of its no par Common Stock through the First Industrial Issues Corporation of New York.

The capitalization of the company consists of 60,000 shares authorized, all of which are presently to be outstanding.

The company operates an airport at Armonk and work will be begun immediately to improve and expand the field to conform with requirements for Grade A rating by the Department of Commerce. The corporation distributes Fairchild and Challenger planes and is the metropolitan dealer for Fairchild Aerial Surveys, Inc., as well as operators of a flying school and taxi services from its field.

A new plan has been approved by stockholders of the Kinner Airplane & Motor Corporation which will increase the present capitalization from 600,000 $1 par shares to 2,100,000 shares of the same par value. Present stockholders will receive rights to purchase 2½ shares for each old share held, at $1 per share. A request has been made by the management, however, that stockholders will waive their rights to the one-half share, which stock will be used for allocation of manufacturers and distributors. The corporation's Commission of California has yet to approve the plan, but there is every reason to believe that this will be accomplished shortly and stockholders will receive valuable rights.

Air Investors, Inc., has announced through Mr. H. L. Williams, the President, that the company will shortly acquire control and assume management of a new $3,000,000 investment trust which will probably be called the United Aviation Company. The new company will take over the United Aviation Corporation of Chicago and after disposing of control in operating subsidiaries, will retain a minority stockholding in various aviation and allied enterprises.

The Waco Aircraft Company, formerly known as the Advance Aircraft Company, is now capitalized at 200,000 shares of authorized no par Common Stock, of which 145,000 shares are shortly to be outstanding. A syndicate, headed by W. E. Hutton & Co. of New York, has offered 25,000 shares of the no par Common at $23.50 a share. This does not represent new financing on the part of the company as the stock was purchased from various individuals.

It is reported that the Aviation Corporation has acquired an interest in the Waco Company which, however, has nothing to do with this offering.

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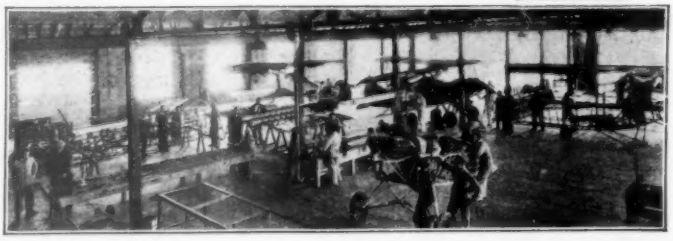

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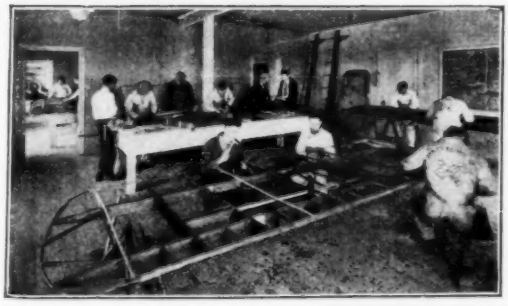

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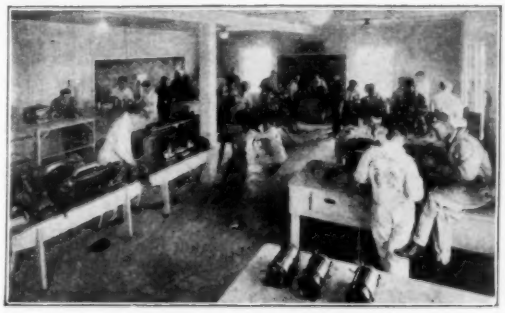

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Working with a Genius

(Continued from page 15)

demonstrating his ships; but he tires quickly on cross-country trips, becomes nervous, and the altitude never suits him; he alternates between going to the cockpit to give the pilot instructions, going through his ever-present tightly packed brief case, and sleeping. That day he delighted in getting down on his knees and feeling the heat pouring into the cabin from the newly installed heater.

We were amazed upon reaching Detroit to have Mr. Fokker request us to remain over the week-end and do some work for him. We were only too glad to be of service; it meant seeing him at close range and studying this man of parts whose life has been such a glorious adventure.

Never shall we forget the dinner that night at the Book-Cadillac Hotel. There were eight in the party, or rather we ended the dinner with eight, as when we went in to dinner Mr. Fokker forgot his most important guest who was waiting in the lobby; and it was only after the first course that he realized the import of the vacant chair.

I have never been more impressed by Fokker's ability than I was that night at dinner. Surrounded by men who had been interested in aviation for almost as long as he had been, he was easily their peer. He illustrated the reasons for certain airplanes having various characteristics on the back of the menus; and those cards were taken home by the guests and studied; they knew that his theories invariably prove to be correct.

After dinner work began, and it continued until after three in the morning. His suite was a chaotic place—papers were scattered over every inch of flat space, with one particular pile which he insisted demanded immediate attention and which was never even touched. The telephone buzzed; messengers darted to and from the room; ostensibly we were as busy as the committee room of a national political party during a campaign. But the major portion of our efforts were lost motion. The work we really accomplished within those five hours could, the way American business is conducted, have been taken care of in at least an hour and a half. The last hour I was so exhausted that I sat on the floor, resting my head against the bed, to keep going. And when we finally stopped for sleep, at three A. M., Fokker said:

"Miss Schunck, what time will you be ready for work in the morning?"

"Not one minute before ten."

"What—and I haf appointments beginning at seven? Why you need so much sleep?"

"Mr. Fokker," I replied, "you may have appointments from this minute on, but I'm exhausted. You may call me at ten."

And exactly at the stroke of ten next morning he did call. Another hectic day—a day that lasted until ten that night, when he left for Chicago, and we for Dayton.

But interspersed with the work were a number of humorous episodes. For instance: He told me to call a certain man at the Statler Hotel, and here is the conversation which ensued when I had the man on the line:

"Who iss diss? Who? . . . . Oh, iss diss you, Jim? . . . . Fokker speaking. I am too busy to talk to you now, Jim; I will call you later."

The statistician who was compiling some figures neglected to take into consideration one of the major items.

"What? Look what you have done. I will reduce your salary one-fourth. But, wait; I will increase your salary 50%; I am glad you have done that thing; it has made me think of things I would have forgot."

A telephone call. "Yes, diss iss Fokker. . . . . What? You think I sell airplanes like you do hot dogs?"

His favorite mechanic, a regular Don Juan, called. He was told that he might as well come up right away and see the two secretaries; but we were warned that the man had wicked eyes; we were not to flirt with danger. He did prove to be attractive, and Fokker's remark to me was:

"Have you not remembered my instructions? But you have that same light in your eyes. You, too, are dangerous."

About eight that night we were nearly famished; no food since morning, for we had not wanted lunch. But it took two hours of heckling to get dinner. Fokker carries loaf sugar in his pockets most of the time. Recently, when an eminent physician suggested eating sugar when tired, I decided that the sugar eating habit of Fokker's was the secret of his energy and need for little sleep. Later on, when I was working with him and serving him tea each afternoon, I found that he wanted at least four spoons of sugar in a cup of tea. His appetite for sweets cannot be satisfied. I have seen him refuse solid food on numerous occasions and order five or six of the most honeyed desserts on the menu. This probably accounts for his dislike of liquor and tobacco, neither of which he uses.

As is usually the case when one travels with Fokker, Miss Jacobs and I had to run for our train. He very seldom makes reservations, and he never boards a train with more than a minute to the good. He enjoys that kind of a departure; but it exhausts his entire staff trying to get him to the station on time.

When we returned to McCook Field, one of my friends asked how I would like to work with Mr. Fokker daily. I said I'd love it, but I'd have to spend one month out of four in a rest cure as he seemed to sap every bit of energy I generated. I was later to find out how true that was. I have never been in awe of him; he is too primitive to inspire awe, but he keeps one always on the alert as, due to his disconnected method of thinking and expressing himself in English, one must learn to read his mind and anticipate his desires, and that is not always an easy task.

Shortly after this airplane trip, Mr. Gott, the Sales Manager of Mr. Fokker's American company, suggested my coming to New York to become his secretary. In the spring of 1926, I landed in his office. The day I reported for duty was the day Commander Byrd's North Pole Fokker Trimotor, the "Josephine Ford," was loaded on the S.S. Chantier for shipment to Spitzbergen; and that was the identical airplane in which we had flown from Dayton to Detroit with Mr. Fokker. Commander Byrd has laughingly remarked on more than one occasion that Mr. Fokker has never quite forgiven him for taking his demonstrating ship to make that glorious North Pole trip! Mr. Fokker, in the meantime, had gone to Europe, and when he found me in the New York office upon his return, his sole comment was:

"So, you are here?"

But he did put me to work at once, for that afternoon he took his secretary and me to tea at the Waldorf-Astoria and alternated between dictating to the two of us and eating peach tarts.

Practically the only time I saw Mr. Fokker during the summer of 1926 was when he was in the office examining his movie films. He has always taken particular delight in the use of the movie camera, as stated above. He designed some sort of a contraption whereby he straps the camera on the tail of the airplane and photographs the country he flies over. He seldom projects his films; his chief delight seems to be in minutely examining the developed negative, and frequently he does not even have a posi-

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tive copy made. He also spent considerable time on his yacht, the "Honeymoon," which he brought along from Holland that spring.

Fokker tells one very interesting tale about his love of yachting. When quite a child he particularly envied the owner of a yacht with a crew of eleven. He decided that when he had made his fortune, he, too, would have a similar boat with a crew of identical number; and he made this dream come true. But he found that the pleasure was greatly over estimated, and after one season sold the large yacht, and now operates one with a crew of two, which he says is one too many.

Shortly after Mr. Fokker returned to the States in the spring of 1926 he took out his first papers. Somehow, I can never picture Fokker a nationalist of any country. He has been too cosmopolitan, it seems to me, to heed any national feeling. Born on the Island of Java, in the Dutch East Indies; the greater portion of his childhood spent in Holland; a resident of Germany during the great conflict, building planes for that nation; back to his native Holland after the war, building up a successful business there, Fokker is now an embryo American. To be sure he is splendid material for our melting pot, for he certainly has no national prejudices to eradicate.

When the man who was responsible for my coming to New York left the Fokker organization and requested me to join him in his venture, Mr. Fokker amazed me by requesting me to become his secretary. I insisted at that time, and still maintain, that he simply wanted my services because a competitor also wanted them, but he told me that he had wanted me in that capacity since the Detroit trip. I was flattered; I knew it meant an exceedingly hectic existence, but most assuredly not a monotonous one. And after due deliberation, I finally accepted his proposition after he had reluctantly agreed to meet my terms, a portion of my salary to be paid by him personally. At the end of the first month, I presented a check for his signature to cover the increase in salary; if I presented that check to him once for signature, I did it at least a dozen times before I convinced him that I absolutely meant to have that amount of money each month. After about the third month it dawned upon him that I was a real business woman who demanded her rights,—after which I encountered no further trouble.

I certainly earned that money. Fokker had the habit of calling me at the office about four in the afternoon, where I had been on duty all day, asking me to come to his hotel. That meant being on duty there night after night until midnight and after. And he expected me to be at the office regularly at nine.

One amusing incident comes to mind. He knew how I catered to probable customers and one night when I was lounging on the davenport, taking notes, propped up with cushions, my feet stretched out on the cushions (forgetting the present length of skirts), he said,—his eyes twinkling:

"I suppose that that skirt is for the benefit of customers also?"

Laughingly, I replied: "Mr. Fokker, if coming to work in a bathing suit would sell airplanes, that would be my uniform."

It was not all work during those long hours. They were interspersed with playing with the radio, inventing contraptions for the furnace, trying to train "Bum," the pet wired haired fox terrier, in Dutch, German, French, and English; and by servings of hot chocolate and club sandwiches at all hours. Whenever I began to look exhausted, food was ordered, with usually the injunction: "Now, you must write me a memo that I have not starved you." He never forgot my begging for dinner that night in Detroit.

One day he asked me to write a letter of condolence to one of his associates whose father had just died. I did not know the man, and still I wanted the letter to be sufficiently personal, so I

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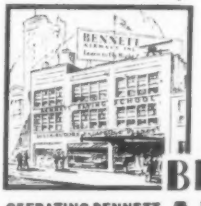

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spent much longer than usual trying to arrive at something which seemed suitable. I presented the finished product to Mr. Fokker, and he remarked:

"I do not think I will send this letter."

"Why, Mr. Fokker, it really is a particularly good letter. What is your objection to it?"

"I am not criticizing your letter; but do you know what he will say when he gets it? 'Mr. Fokker—he did not write this letter.'"

I finally managed to get him to sign it by telling him that his comment would instead be: "What perfect English Mr. Fokker uses."

His favorite method of signing his name is merely "FOKKER," and he delights in signing it with a match dipped in ink, instead of using a pen.

Early in the spring of 1927 Fokker brought over his household goods from Amsterdam and established his residence in a charming spot, topping the Palisades, on the Hudson. He possesses a number of valuable and interesting art objects,—an unusual side to his character. He loves the country. He dislikes the crowds of New York, and is childishly unhappy in the subway.

It was also in the spring of 1927 that we moved our headquarters to the factory at Hasbrouck Heights, N. J. That meant exceedingly long hours, inasmuch as we often left the factory at seven to drive to his home for dinner, and then worked until midnight; and it took me an hour and a half to get from his plane to my home.

However, being at the factory gave me an opportunity to watch the development of the planes, as well as their actual construction. Commander Byrd's Trans-Atlantic ship—the "America"—was being constructed that spring, and many were the minutes I spent crawling around in it. I begged Mr. Fokker when it was completed not to make his final inspection and list of all the changes from the stock model until I could be with him.

Fokker was intensely interested in the success of this enterprise, and I have always felt that he regretted not being a member of the crew of the "America." He was terribly disturbed by the unfortunate accident to the "America" on its trial flight, and for weeks thereafter was exceedingly nervous. It will be remembered that this ship was seriously damaged during its first flight test, during which Mr. Fokker acted as pilot, and which resulted in the serious injury of the late Floyd Bennett, and minor injuries to Commander Byrd and Lt. Noville. Fokker is not of the sympathetic type, yet he was miserable in the face of Floyd Bennett's serious injury, and devoted more time to calling on him than I have ever known him to give to anyone else.

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Fokker displays as keen enthusiasm over his present developments as over his first attempts. One day he almost left me behind at the factory,—I was crawling around his latest Army Bomber and could not be found when he was ready to leave; but when he did locate me, he took the trouble to point out all the improvements in the ship. He explained going home that night that he felt the same keen pride in every ship built, for of course they all reflect his genius.

Fokker has one prime characteristic: his love of publicity. He loves it and cultivates it as much as Barnum did; and when he will flatly refuse to be bothered with anyone, a reporter can storm the gate and receive a hearty welcome. The various transoceanic flights during the summer of 1927 gave him more than his share of it, and he reveled in the hours spent surrounded by reporters in the Garden City Hotel, which was the headquarters for all those intrepid flyers: Lindbergh, Byrd and his crew, and Chamberlin. He is always good copy; a picturesque figure, an eccentric, whose utterances about aviation are always worth publishing for he knows his subject, has a sense of humor, and an unusually keen perception of news value. He delights in stressing his own eccentricity on the grounds—as he so often says—"I am different." I believe that most of his idiosyncrasies are poses pure and simple; he has found that they work, and he loves to work them.

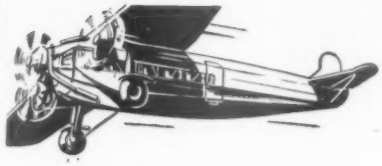
In my estimation, Fokker is not a keen judge of men. He is instinctively wary of one and all; no one obtains his complete confidence. Even with his personal attorney he plays a game of secret diplomacy. He cannot believe that anyone ever shows a complete hand.

He is indeed shrewd; he finds loopholes in contracts which his assistants have approved; but he often antagonizes by his suspicion about the man's intentions.

It is extremely difficult to obtain Fokker's signature to a paper; but he has the utmost respect for the validity of paper, and once his signature has been obtained he does not quibble over the outcome.

He demands very little sleep—four to five hours suffices. He eats sparingly, not at all regularly, and, as I said above, is devoted to sweets. He arises unusually early, says his best ideas come early in the morning, and therefore keeps a drafting board, paper and pencil on his bedside table. He has been known to call business associates before six in the morning. He has no hesitancy in disturbing anyone, at any hour, for he firmly believes that the mere mention of the name "Fokker" will obtain a hearing.

He is cunning, and he admires cunning



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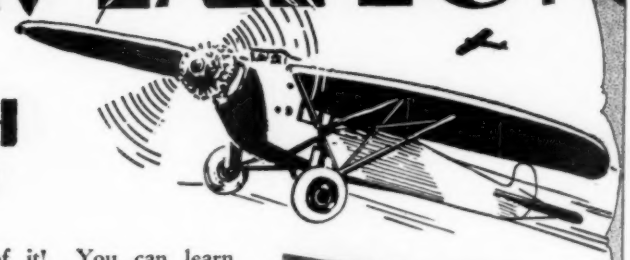

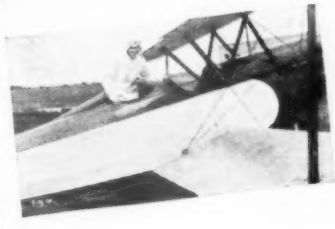

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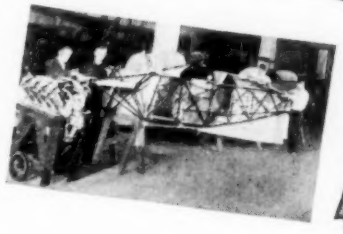

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in anyone. He loves to "put something over," whether the net gain to himself is five cents or five thousand dollars. His desire for power, for control, is keen. He does not actually love money; he says it is merely a commodity like coal that is essential to his business and his home, but he thoroughly dislikes being asked for cash. He will neglect to study financial reports, but if he is requested to supply any sizeable amount of cash, there is a conflagration and he immediately orders a retrenchment policy.

He is a lover of speed: in the air, in motor boats, in automobiles; and yet he dislikes making decisions. He is lacking in the social amenities, but is as individual as a tooth brush, and can always be amusing. He has been known to attend a dinner in Washington, and arrive at the New York office the next morning in his Tuxedo. He is not a man of varied interests; he is too much engrossed in himself for that. He reads but little; he plays comparatively little; all his life is woven around his airplanes.

Is that the secret of his success? I don't think so. I believe his success is due to an uncanny intuition about airplane design and construction; to the fact that the war came at the most opportune time for his fortune; and to the fact that he has been sufficiently far sighted to capitalize on his war time reputation. He is shrewd, clever, astute, and a good bargainer.

He has gone far. With his present business connections in the United States, I believe that his genius will always dominate the trend of aviation.

What Men Flyers Think of Women Pilots

(Continued from page 30)

The average woman pilot, if such a person could be found, would I think rate about as well as the average male pilot of equal opportunity and experience.

One dangerous generalization which men are apt to make and which was promptly made in our discussion, would thus appear to be somewhat unjust. Before our talk had gone very far it appeared that most of the men present believed that the usual motive leading women into aviation was the desire for publicity. Instances were advanced and names were mentioned. Thus it was decided that since women for the most part went into aviation with unworthy ideas in their heads, their subsequent careers in that field very naturally tended to turn out a flop.

At this point I called attention to the fact that a hundred and fifty years ago Benjamin Franklin said, "Affect not to be seen, and Men will less see thy Weakness. They that shew more than they are, raise an Expectation they cannot answer; and so lose their credit as soon as they are found out." Benjamin Franklin was a man and represented the masculine point of view, but he told the truth even so. Applying his remark to the topic under discussion I suggested that men are far more critical of women than they are of each other, both in the cockpit of an airplane and everywhere else in life. The assembled flyers agreed.

A woman who is not an unusually good pilot had either better give up flying altogether or reconcile herself to the idea that she will be the object of much painstaking criticism. Fairly or unfairly, her mistakes are noticed more than those of a man. Suppose two pilots, one a man and the other a woman, crack up two ships of the same make, under the same circumstances, and at the same time, the woman will receive far more publicity than the man, together with the patronizing comment from the masculine half of the world that while as for the man the crash was a more or less astonishing exception to the rule of things, in the case of the woman it was no more than was to be expected.

The one hopeful thought that can be drawn from this situation (and this thought did not come out in the discussion) is the fact that if women are generally expected not to make good as flyers then those women who do make good are of real value to the airplane industry. A good woman pilot brings as much fa-

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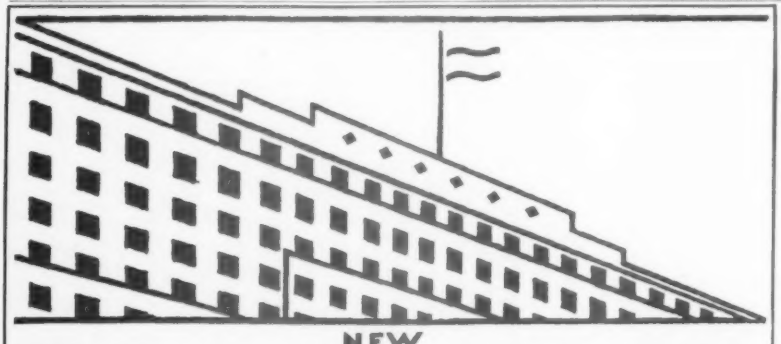

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vorable advertising of airplanes and their operation as 150 times her weight in good male pilots can hope to do. Accordingly it would seem that, by and large, women are at least as useful to the aircraft industry as they are embarrassing.

The men by this time were feeling that the discussion was a tremendous success. I was surprised when the rather sympathetic remark was offered that it must be admitted that some girls, unreconciled to merely being girls and making the best of it, and moreover sincerely anxious to help the cause of aviation, desired to learn to fly. The men graciously asserted that such women were to be encouraged. Women of this type, it was felt, are rare but possibly for that reason as much as for any other they are to be admired, if not for their flying ability at least for their ambition and their modesty.

Curiously enough at this point the discussion began to get out of hand as the men insisted on ignoring the stipulated topic of women as pilots and concentrating their remarks more and more on women as women. Some of the men were married and they said touching things about their wives. "There is a real woman for you," said one. "She knows what flying means to me and never says a word against it." The reminiscing grew fonder and it was significant to note that it concerned itself exclusively with non-flying women. By and by somebody said something which seemed to me to explain a good deal of the psychology of the thing and in a sense to sum it all up: "Any woman, whether she is flying or not, ought to know better than to surpass a man at anything if she wants to be a success as a woman."

Who cares whether women can fly or not? The point is, why should they? Leave that to the men. When this idea had been advanced a sufficiently long time and in sufficiently simple language for every man in the group to clearly comprehend what had been said, an atmosphere of peace and good will settled down over the gathering. The women in aviation who do not fly were approved and applauded. The flyers, all friendly now, gave themselves up to memories of the women who stayed at home waiting for their men to return from pioneering a new trans-Atlantic air route; to build better and bigger ships and make aviation at last a real business; to do in short, all the fine and daring and worthy things that women must not aspire to do, and who loved their men anyway and gave them their faith and admiration. In aviation, it would seem, as in most other departments of life, man must have a non-competitive and appreciative audience.

Perils of Over Expansion

(Continued from page 16)

logically laid to the check on new bond financing which has resulted from high interest rates. Building propositions cannot draw their capital from stock "rights" as can going corporations. There is a tendency toward overcoming this handicap by issuing building securities which grant the investor a share in the possible future profits of his project in excess of a fixed interest return, but the movement has not become wide enough to check the decline in volume of new building security issues.

The result has been an appreciable reduction in building projects begun throughout the country. After showing as much as a 30% decline from 1928 during the early months of the year, building contract figures staged a good come-back in April but the recovery has not been fully sustained. May volume of nation-wide construction dropped back below $600,000,000, or a decline of 13% under last year. For the first six months of 1929 total volume of new building is fully 10% below the same period of 1928. It is only reasonable to expect a continuation of this movement, though there is nothing to indicate that it will show much further recession from comparable 1928 figures, or any more drastic declines than have already been witnessed.

With building and the motor industry running below their previous levels, demand for steel from these lines does not appear to have fallen off alarmingly. In addition, an increasing demand from ship-builders, the railroads and railway equipment makers has taken up much of the anticipated slack. The steel industry has held up much better than was expected, and though operations display a modest seasonal reaction, they are still from 8% to 12% above the corresponding period of last year and the industry is in a definitely favorable position.

The aviation industry is one which, though comparatively new, is still sufficiently in popular favor to permit of adequate financing through stock, rather

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than bond, issues, and there seems no indication of any dearth in funds for air expansion, either in transport or actual construction. The industry is too young to furnish as complete data regarding fundamentals of nation-wide output as is the case in other industries, yet there appears no nearby check to the generally favorable progress of such companies.

Attention has been called especially to the commercial possibilities of the airplane as a common carrier by the opening of the new combination air-rail services between the Atlantic and the Pacific coasts. Universal Aviation, combining with New York Central and Santa Fe, and Transcontinental Air Transport, combining with Pennsylvania Railroad, have both gotten their new services well under way. Demand for such combination air and railroad travel across the Continent is dependent largely on public faith in the safety of such travel, comparatively low rates and public consciousness of the new form of transportation.

Public faith in safety is being constantly built up, rates are already fair in comparison with all-rail tariffs, and so far as public recognition is concerned this factor is being rapidly pushed, and success seems but a matter of time.

Airplane and motor manufacture still shows a healthy expansion. Aviation exports from this country are running approximately double those of last year, and it is certain that 1929 will again eclipse by a wide margin the production figures of 1928.

The dangers of too-rapid expansion, calling for the intermediate depression which has so regularly overtaken our new industries, have not disappeared. But one of the best safe-guards against such condition is the conservative management of most concerns in the field and the fact that such managements are not blind to the dangers from over-expansion.

The best advice in regard to aircraft stocks is the advice always given by responsible bankers and other investment authorities: "Buy the best."

Selecting Aeronautical Securities

(Continued from page 17)

competition with the B & M and southward from New York in competition with the Pennsylvania. The development of the aeroplane industry will create a serious problem also for those railroads which are contending with mountain routes, bridgeless rivers and lakes and other handicaps.

In contrast with the foregoing types of railroads there are other roads to which aeronautics may prove a material blessing. Like the motor coach, the airplane will tend to become an important feeder to certain lines. Moreover, supplemented by motor coaches and motor trucks, airplanes will help to do away with the operation of railroad branches that cannot be run at a profit. There are still other railroads now suffering from inability to approach certain large cities within about 100 miles, and these roads may find in the airplane a key to the present difficulties. Some railroads of about 400 miles in length offer a complete night's run and at the end have to turn their Pullmans over to another road, which carries the passengers to their destination. With the help of airplanes such roads could extend their haul without the need of turning over the Pullmans to competitors. In brief, one effect of progress in aviation will be to enlarge the transportation radius of certain railroads without building more mileage, without transferring their passengers to other roads and without assuming the burden of costly terminal facilities.

Investments in Allied Lines

As readers of AERONAUTICS will realize, the great web of air routes for mail or passenger business is fast being woven. One of the most interesting links was the Florida to Panama Canal Zone air mail route opened by Colonel Lindbergh. With this development in progress there is coming into sight a large volume of business for airplane manufacturers producing the fleets of new planes now going into service. It is estimated that production this year will be from 10,000 to 12,000 machines. In 1928 production was but 4,000. The figures published by the Aeronautical Chamber of Commerce set the value of aircraft output in 1928 at $75,000,000. This compares with only $5,000,000 in 1921. Figures like this fire the investor's imagination; and he should periodically remind himself that in spite of these evidences of growth, consistent profits can be made only by concerns with adequate management and financial backing.

In trying to forecast this survival of the fittest, investors should particularly stress two points: Permanent success will be won only by those who produce sound products. Aeronautics is an industry, the very nature of which puts a premium upon soundness. A second point to watch is the efficiency of a concern's sell-

ing organization. Skillful manufacturing and clumsy selling was never a good combination in any line and it cannot get very far in the aviation industry. In connection with the sales department it is worthy of note that the export market is capable of rapid expansion. Foreign countries as a rule are vitally in need of better transportation and their interest in aeronautics is already aroused. The swelling volume of production will branch out into corresponding demands for materials and for greater and better equipment. The map of the U. S. is becoming dotted with landing fields and one can foresee these as big supply and servicing stations for planes. Fuel distribution alone will amount to an enormous business.

There seems a little doubt that aviation is going to transform the commercial transportation of passengers. The result of studying such possibilities leads to increased enthusiasm over the future of aeronautics. It is within the realm of possibility that within the next ten years, for example, practically all of the first class mail and a great percentage of passenger traffic will be conducted by air.

We emphasize the fact that one should not take a narrow view of the aviation industry but should especially try to foresee the reactions upon allied or competitive lines. In other words, in order to invest in the aviation industry it is not enough to buy the securities of aviation companies. Every business man who adjusts his own affairs so that wherever possible his present business will profit by a development of the aviation industry—this man is truly *investing* in *aviation*, even though he holds few stocks or bonds.

What Securities Look Best

It is no small undertaking to make a survey of the security field so as to rule out companies which are in a purely experimental stage or whose stocks are selling too high in view of the capitalization. There is more than one company which might be considered for investment purposes if the company did not have an excess number of shares outstanding so that at present capitalization it cannot be recommended. A survey of the field suggests that considerable competition is likely to develop in air transport because competing lines can be started at relatively small cost. In view of this the investor is especially interested in organizations which will have their own flying fields and it seems probable that such companies are fundamentally in a sound position. There are indications that during the next few years most substantial profits will be made on the sale of planes and other aviation equipment rather than in connection with pure transportation.

As already noted, the concern which has the most effective sales organization is primarily best situated to succeed. Moreover, a sales organization can most effectively handle the sales of airplanes if it has the advantage of flying fields. Just at present the public seems to visualize flying fields in connection with transportation service and the training of pilots, but it will eventually be seen that the flying field is an essential for the sales department. In this connection it is becoming evident that customers prefer to buy the make of plane which they have learned to fly. This puts into a commanding position the company which has an organization of flying fields and training schools. Finally, the investor scrutinizing the aviation industry will conclude every analysis by concentrating on the everlasting essential of all investment, namely, character and management, which determine the stability of investment.

Don't buy airplane stocks on tips and rumors. The companies most worthy of your consideration can show financial statements and records of performances. Of all the hair raising stunts which the industry has ever witnessed the most hazardous flights are flights of the imagination.

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Consolidated Aircraft Corporation has leased additional space from the American Terminal Warehouse Company to accommodate its expanding activities; it now is employing over 600 men, the largest number in its history. The Corporation reports that it is manufacturing the only commercial training airplane built to military strength specifications and production of this type is estimated at between 500 and 1,000 during next year, of which approximately 300 already have been sold.

Consolidated Aircraft planes and flying boats have flown more than 20,000,000 miles in the military service of the United States. More than 4,200 Americans have received flying training in Consolidated "Huskies" with not a single fatality reported which could be traced to a failure of any part of the airplane.

More and more busy executives are finding it expedient to cover great distances in the shortest possible time and this is reflected in the ever increasing number of orders received by Consolidated Aircraft Corporation for commercial planes. The convenience of air transportation by flying boats daily is becoming more apparent and the tremendous future of this form of transportation will be shared by Consolidated Aircraft Corporation, which at present is manufacturing the only large passenger transport flying boat built in the United States. The Corporation also rapidly has been developing a foreign demand for its products and reports an order for twelve military training planes recently received from South America.

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A Compressed Air Model

By Bertram Pond

(Continued from July)

IN the last issue we described the method of making the tank for the big compressed air engine driven monoplane. In this issue we will describe the making of several other parts, including the fuselage and the wing. The method of making these is very simple, and if you study the directions and the drawings very carefully you should have no trouble.

Materials Required for the Wing, Fuselage and Landing Gear

2 pcs. 7/16″ sq. x 40″ balsa for entering edge and tips.
5 pcs. 3/32″ x 5/32″ x 40″ balsa for joining ribs and trailing edge.
1 pc. 1/16″ x 2″ x 40″ balsa for ribs.
6 pcs. 3/32″ x 9/32″ x 40″ balsa for making the rear wing beam.
1 roll of ½″ special tank fastening tape.
1 pc. ⅜″ x 5/32″ x 18″ balsa for elevator.
1 pc. ⅛″ x ¼″ x 20″ for fin bracing.
1 pc. 1/16″ x 2″ x 20″ for elevator and fin, ribs and edging.
1 pc. 1/16″ x ¼″ x 4″ bamboo for tail skid.
2 pcs. 7/32″ x 9/16″ x 38″ balsa for longerons.
1 pc. 9/16″ sq. x 9″ balsa for body cross braces.
2 pcs. 2⅝″ sq. x ⅝″ thick balsa for wheels.
4 pcs. 3/32″ x ¼″ x 15″ bamboo for landing gear struts.
4 No. 2-56 nuts. 4 No. 2-56 x ½″ Rd. head screws for attaching landing gear.
8 No. 6 washers.
1 pc. of ⅛″ diameter thin wall hard brass tubing 12″ long for axle.
1 4 oz. can of ambroid.
3 sheets of 21″ x 31″ Japanese tissue paper.
1 2 oz. bottle of paper cement.
1 2 oz. bottle of light dope.

Wing Construction

Follow the drawings carefully and you will have no trouble in constructing the wing. First make 14 ribs to an actual size pattern or metal template. Be careful in making these ribs that the notches for the rear spar and for the strip joining the ribs are accurately located. The ribs can be made exactly alike by pinning them together and sanding all of their edges with a sandpaper block.

Make an actual size plan of one-half of the wing and cement the parts together by fastening them over their respective places on this plan of the wing with weights and pins.

You will note from the drawing that the entering edge is shaped to the curve of the entering edge of the rib by carving and sanding. The entering edge should not be hollowed unless the wood is very tough, as this is one of the main strength members of the wing. The rear spar of the wing is a built up "I" beam consisting of two full length strips 3/32″ x 9/32″ long forming the top and bottom caps of the "I" beam. The web or center part of the "I" beam is made by inserting short pieces of this same material between each rib. Be sure that these webs are set in straight. Ambroid all of the ribs securely to these "I" beam caps and webs. Thin ambroid should be run along the crack where the web fits against the cap strips. Now carefully re-check all of the joints on the wing halves so that you are sure they are well ambroided together before proceeding further.

Make a left handed wing half and also a right handed wing half. When the wing halves are completed they should be joined at the center, using several coats of ambroid. The center ribs when the wing halves are joined should just fit over the motor base, so refer to the drawing and remember this point when making the motor base. In joining the wing halves together they should be blocked up at the tips about 4½″ from the table with the center of the wing halves resting upon the table. This gives you the required dihedral angle for stability and for locating the center line of thrust properly with relation to the center of the wing drag. The wing tip is very simply constructed and should need no explanation.

The wing should be carefully covered with a Japanese tissue or gold-beaters' skin or even China silk. Do not cover the top of the little center section between the main spars, as the frame sits down between the two center ribs. Watch in doping the wing that it does not warp out of shape. However, there should be a little more incidence in the right wing tip when viewed from the front to counteract the torque of the propeller.

Constructing the Fuselage

Cut three blocks from the 9/64″ square piece of balsa 2 1/16″ long. One face on these three blocks should be rounded out to fit the curvature of the tank. Ambroid them in place as shown in the drawing between the two body longerons so that the hollowed out faces are all upward. Draw the rear end of the sticks together and ambroid them together, holding with pins. Cut another short piece 9/16″ square by about 1″ long as a frame cross brace where the front of the fin is attached. Be sure that the frame is straight and ambroid the last cross brace in half way between the fin brace and the brace for the end of the tank.

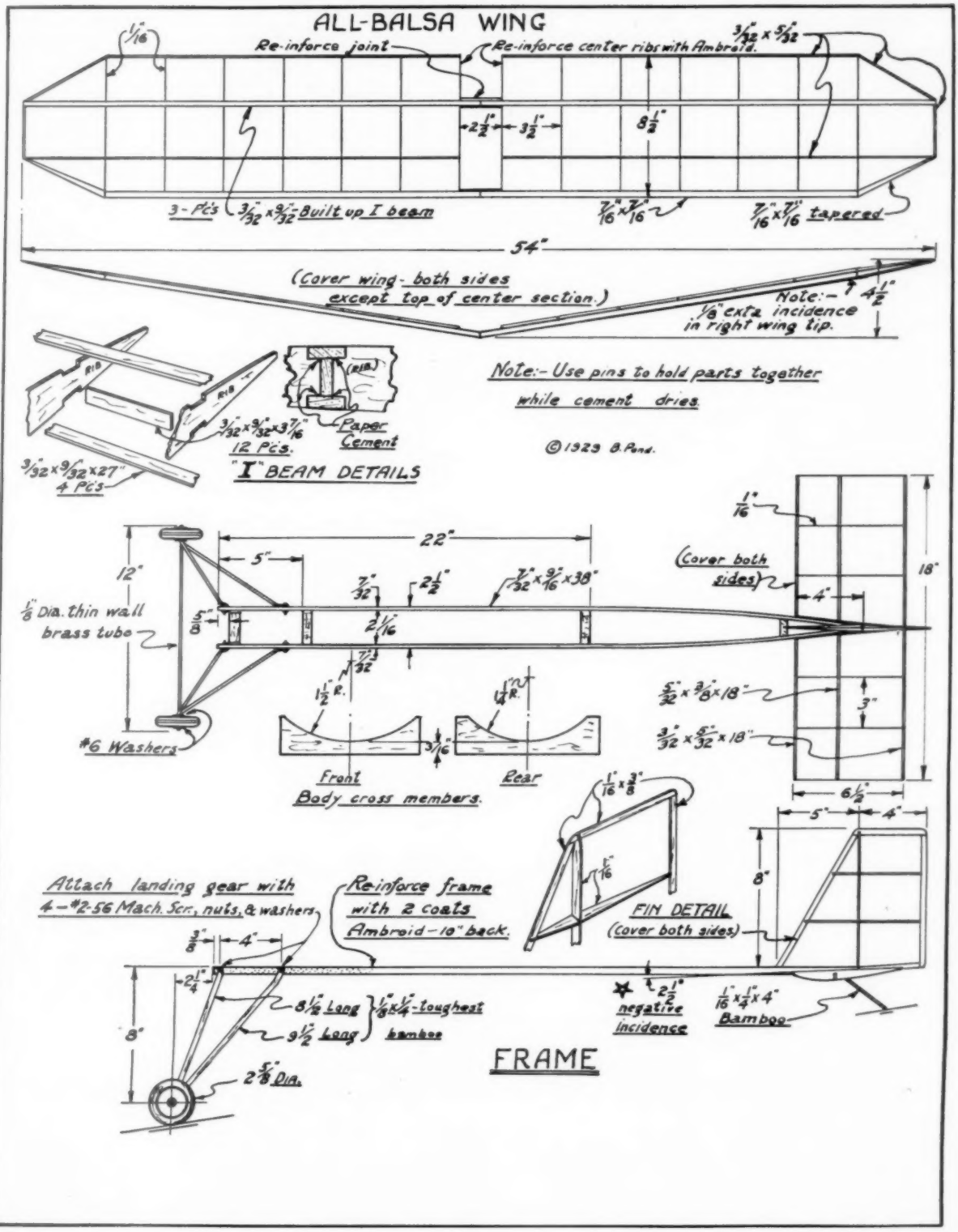
Construct the fin and elevator as shown in the drawing. Attach the fin so that it is practically straight in front and back. Attach the elevator so that there is a slight negative incidence and place the camber on the bottom. The elevator should be flat on top. The elevator is made in practically the same manner as the wing. You will note that the two center ribs in the elevator are set in at an angle and fit up against the sides of the fuselage. Brace the fin to the elevator with two ⅛″ x ¼″ pieces extending from the next to the top rib in the fin to the next to the end ribs in the elevator. See the drawing. Slip the 1/16″ x ¼″ x 4″ bamboo tail skid piece in between the body longerons at the rear and ambroid it securely in place to form the tail skid. It should project downward or be on the opposite side of the fuselage from the fin and the hollowed out place in the cross members at the front. Carefully cover the fin and elevator with the same material used on the wing.

Make four heavy bamboo pieces stream lined. These should be ⅛″ x ¼″ tough Tonkin bamboo and of the length shown in the drawing. Make a small bend in one end of all of these landing gear pieces. ⅛″ from the end with the bend drill a 5/64″ to 3/32″ hole in the bamboo and reinforce the bearing and the portions around the hole with a coat of ambroid.

To stiffen the frame where the landing gear is attached, it should be coated with two coats of ambroid for a distance of 5″ back from the front and one coat of ambroid back as far as 10″ from the front.

Join the lower ends of the landing gear struts with ambroid and when the ambroid is thoroughly dry cut a small notch in the lower ends of these struts

A Compressed Air Model


ALL-BALSA WING
Re-inforce joint
Re-inforce center ribs with Ambroid.
3 - Pcs 3/32 x 9/32 Built up I beam
7/16 x 7/16
7/16 x 7/16 tapered
54"
(Cover wing - both sides except top of center section.)
Note:- 1/8" extra incidence in right wing tip.
Paper Cement
12 Pcs.
"I" BEAM DETAILS
Note:- Use pins to hold parts together while cement dries.
© 1929 B. Pond.
1/8" Dia. thin wall brass tube
#6 Washers
Front Body cross members.
Rear
(Cover both sides)
FIN DETAIL
(Cover both sides)
Attach landing gear with 4 - #2-56 Mach. Scr., nuts, & washers.
Reinforce frame with 2 coats Ambroid - 10" back.
negative incidence
Bamboo
FRAME

A Sensational Sail-Plane for Silver Ace Flying

Every model owner should enjoy the sport of flying this latest product of SILVER ACE engineers. It has a demountable tapered wing and a celluloid fuselage. In performance and appearance it will surprise you. Launched by hand, catapulted from the ground or released from an altitude, it will teach you much about the new art of gliding. Priced $1.50 at all Silver Ace Dealers.

If your dealer does not carry the Silver Ace Sail-Plane, or any of the other Silver Ace Flying Models illustrated on this page, send us the list price for each plane, plus packing and shipping expense, which is 25c on the Sail-Plane, or 50c on all other models.

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Beautiful Fairchild or Stinson type, easily converted by demountable wings and pontoons into a biplane or seaplane. The best flying commercial model on the market.

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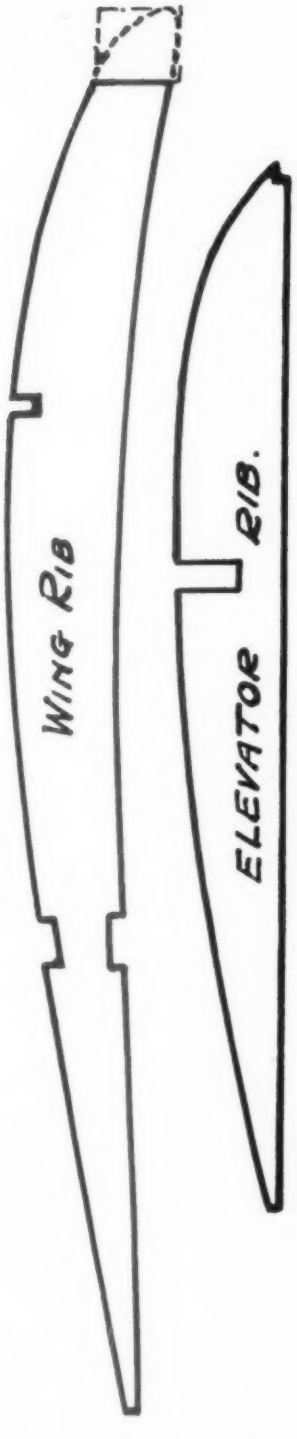
Patterns



Exact Size Patterns for Wing and Elevator Ribs

to fit the ⅛" diameter brass tube axle. Ambroid the axle in this notch so that 1" of the axle extends beyond on each side.

Turn the wheels from balsa blocks on a sewing machine motor or a similar device, making sure that they are the same diameter. Coat them heavily with paper cement and ambroid two No. 6 washers on each side of the wheel to form the bearing. Be sure that these washers are centered so that the wheels will run true. Slip a washer over each end of the axle and ambroid it against the landing gear struts to form a side thrust bearing for the wheels. The wheels should be kept in place on the axle by ambroiding a washer on the outer end of the axle shaft after the wheel is slipped in place. Purchased wheels may be used if they are sufficiently strong yet light in weight.

This covers the model with the exception of the speedy and powerful air motor which will be described in the next issue. With a compressed air model, one is promoted from the egg-beater winder to the tire-pump stage of model aviation. The actual construction of such a plane is not difficult, especially when there remains only the assembling of the motor. The added pleasure that comes from flying a plane with a real engine more than compensates the builder for the extra work. Better have a try at this model.

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of Lindbergh's Spirit of St. Louis. Scientifically designed and very realistic. Equipped with rubber band motor. Rises from ground by own power and flies 40 ft. or more. Easily built without tools. Construction set, with all parts and full directions, postpaid in U. S., only 50c (no stamps). Satisfaction or money back. Send now.
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24 in. wing spread
10 in. propeller

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And remember, it is a complete plane ready to fly two minutes after you receive it.

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Write for our free booklet on model construction

Avigation

(Continued from page 52)

done on chronometers and their errors and records for aircraft. When nautical astronomy becomes an essential phase of avigation, however, it appears that suitable equipment and methods can be quickly developed. At present this phase is strictly secondary.

Transcontinental passenger lines now operating or contemplated will force the expansion of the "ticker" weather system now in use and will force the development of directional radio and aids to fog flying at terminals. These things are vital.

Current development of airways, airway lighting and maps is highly satisfactory. A drift and ground speed indicator that can be operated by a pilot while flying is most desirable, particularly for over-water work. The development of this instrument presents no tremendous problems, yet I do not believe that it exists in a satisfactory form today and it should form the fundamental basis of all avigational work.

At present no one agency is considering all the problems of avigation in relation to each other. A phase that is vital, say, to the Army or to the Department of Commerce means nothing to the Navy. It appears that the co-ordinating agency should be The National Advisory Committee for Aeronautics, or the Guggenheim Fund.

What avigation vitally needs is a committee for development and experiment, with a man like Commander Byrd at its head, with two experienced navigators who are also experienced pilots and two experienced pilots who know nothing about navigation, one of whom should be a radio direction expert. Such a committee should consider all phases of the problem and develop material and methods by actual work in the air.

LOENING AMPHIBIAN

24-Hour Trips Across the Atlantic

(Continued from page 25)

flying gas stations, as warships at sea have their bunkers refilled by colliers and oil tankers.

"The general public has been interested in the speedy pursuit planes with their spectacular rocket-like speed of three hundred miles an hour, and has passed almost unnoticed the remarkable advances that have taken place in bombers since the Armistice.

"It seems wasting of time and money these days to build big guns. The heaviest pieces of artillery, such as the Big Berthas that bombarded Paris, can fire about 27 miles. After twenty rounds they are burned out, and must be rebored.

"The range of a bombing plane, which is more destructive than the biggest gun, is now, for all practical military purposes, almost limitless. Starting from its base with a ton or more of bombs, with each bomb as diabolic as a shell, it could, in time of war, direct its course for the enemy country, perhaps thousands of miles away and waste no time en route by being compelled to stop for gas. A day, or even an hour, too late in war may turn possible victory into defeat.

"It took the nine bombers thirty-six hours of actual flying to cross the continent and more than thirty hours to refuel! It took one week altogether from San Diego to Langley Field to give assistance and rest to men and planes. In seven days the Question Mark could have flown half the way around the world.

"A plane becomes more effective at the release of each bomb. Relieved of that much weight, its range and speed are thereby increased automatically.

"In future wars the bombers will be the infantry of the air. All other types

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FOR SALE—American School of Aviation Correspondence course. Perfect condition. Thirty dollars. Box 155—AERONAUTICS.

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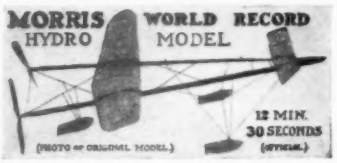

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of planes will be subsidiary to them, as in land armies everything from artillery and tanks to the engineer draftsman at home is but support for the men on foot with rifle and bayonet.

"But while I am particularly interested, as a soldier, in the military significance of the refueling experiment, I can, none the less, see equally great commercial possibilities opened up by it, too.

"I foresee the time—perhaps within five years—when huge express passenger planes will be flying between the Atlantic and the Pacific coasts without making a stop.

"Aerial gas stations will be strung across the oceans and along the great trade routes of the world.

"The airships will keep positions at designated spots, and send down planes with gasoline for the air liners. The planes will wireless their orders ahead.

> "'Deliver 300 gallons of gasoline to New York-Berlin plane No. 4. Will reach you at 3:45 P. M.'

"Wireless messages something like this will be dispatched from the air liners to floating gas stations to insure replenishment of fuel without waste of time. The less gasoline and oil an airplane is forced to carry the more freight and passengers it can accommodate.

"Why all this haste? Is it not madness? Business demands speed and will pay for it. Speed spells money in commerce. Last year bankers saved millions of dollars in interest by sending checks, drafts, securities and other papers by air mail between New York and San Francisco.

"Checks and articles of commerce are not afraid to fly. They can be insured and replaced in case of accident. Airborne commerce in a few years will be a big factor in the trade of the world.

"The time is fast approaching when even passengers will be transferred from plane to plane in the air. They will be brought over feeder lines to the main transcontinental airways and there put aboard the big flyers.

"The railroads find it pays to pick up water for their locomotives from troughs between the tracks instead of stopping at a water tower or tank. The big air transport companies of the near future will find it will save them time and money, too, to refuel their craft in the air.

"Besides wasting valuable time by stopping at airports for gas, all landings put a tremendous strain on a plane and shorten its life. And any pilot will tell you that on every flight there are at least two particularly anxious moments—one when he opens the throttle and pulls the control back to get off the ground, and the other when he shuts off the gas and is about to make a landing.

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1/16" x 1" x 3'		.06
1/16" x 1/2" x 3'	.03	.033
1/8" x 1/4" x 3'	.045	.054
1/4" x 1/4" x 3'	.054	.06
1/2" x 1" x 3'		.24
1" x 3" x 3'		.48
1" x 3" x 3 1/2'		.56

Reed 6' lengths, 1/16" diam. .05c; 1/8" .075c; 3/16" .10c; Balsa discs 1/4" thick 2" diam. .07c; 3" .08c; 4" .09c.

Ambroid dope, 1/4 pint .50; 1/2 pint ..... .95
Ambroid cement, 2 oz. .33; 4 oz. ..... .53
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Rice paper, 18" x 24, .09; 21" x 25" ..... .06
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"The age of flying is now getting seriously under way. Aviation will make gigantic steps forward during the next five years, especially in the United States. Nothing can stop it.

"Even the children these days are air-minded. They are as interested in playing with toy airplanes as the youngsters in my day were with the wooden animals of a Noah's Ark. All these young people will be flying in a few years."

Major Casajus has flown thousands of miles in Europe, Africa and the United States. Had it been possible to refuel his planes in the air, he says, he would have more than doubled his mileage.

In Our Next Issue—

AERONAUTICS for September will carry another powerful article by General William Mitchell. General Mitchell will discuss "Air Power and the Panama Canal." The statements which the general makes in this third article of the series are of peculiar interest, touching, as they do, on the most vital and practical problem of our national defense.

B. C. Forbes is to contribute another article on finance as it relates itself to the aeronautical industry.

One of the most entertaining articles which we have published for some time is Lieut. Frank Wead's account of the filming of "The Flying Fleet." Lieut. Wead wrote the story of the photoplay, and participated in its direction. His description of the tail spin that started in a stall over Pensacola, slipped and spun for a thousand feet or so over San Diego, splashed into an indoor tank at Culver City, and finally burned on the beach at Pensacola is an extraordinary yarn.

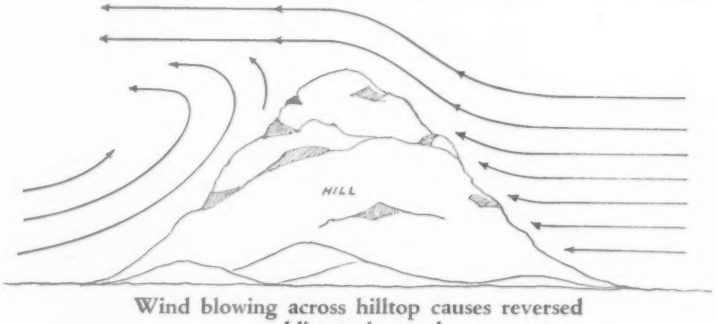
Helicopters and vertical flight are the subject of an article by Ernest W. Fair.

Bumps

(Continued from page 23)

light-weight materials, was subjected to the great bumpiness of this storm. Doubtless, one end was boosted upward by rising air. The craft could not withstand such unusual strain. It had not been tested in just that way. The Commander knew this storm was coming. He could have turned tail and laughed tauntingly at the storm. There being no emergency the airship could have been spared. Someone blundered and at an awful price an experiment was made. This huge rigid airship could not stand the strain. Bumpiness tore it to pieces. An airplane might have slipped to destruction but the bumpiness would not have torn it apart.

The moral is not found in this superiority of airplanes, but rather in the obvious desirability of knowledge of bumpiness, where it is to be found, and how serious it may be. The aerial traveler needs no unnecessary odds against him. Bumpiness alone may be serious in landing or in traveling. When combined with clouds and rain and darkness it may shift the balance against one. Knowledge and experience gained by combining knowledge with observation may keep the balance in his favor.



Wind blowing across hilltop causes reversed eddies to leeward.

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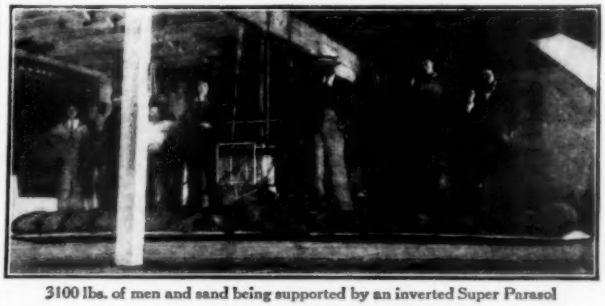

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Attack on Panama!

(Continued from page 13)

"Wasps" and "Hornets," as the planes soared off the deck—for a forced landing at sea and in such darkness might easily have been fatal, but there was never a miss that morning. Pilots might swerve a bit rushing up the narrow deck, but long before daybreak every plane had taken off, and taken off safely. No enemy was in sight, and the "Saratoga" had launched her fateful attack.

As the dawn spread into the sky the ship's officers rejoiced, and congratulated each other ten minutes later when the outlines of four battleships were spied from the foretop. This must be our battleship division, on hand at the appointed place to protect their carrier until the return of her flock. But as the light of the sun spread minute by minute, breaking at last over the horizon, a great light broke also in the minds of the "Saratoga's" officers.

The bitter truth was that those battleships, turning to cut us off, and already less than ten miles away, belonged to the enemy. As they swung into column, the "Saratoga" was faced with a broadside of over forty twelve and fourteen inch guns, which, at sixteen thousand yards, could have blown us to bits in ten minutes!

In real warfare we would have turned and might have escaped with our far superior speed, but this morning it was necessary for us to go on to recover our planes at the appointed rendezvous. The proud "Saratoga" was helpless before the guns of four of the oldest battleships in the fleet!

Not many minutes later, with no warning at all, came the howl of a 400 horsepower motor, racing wide open, and I looked up to see a Boeing fighter flash across the deck, pulling out of an almost vertical power dive. They were coming from all directions in the next few seconds—a beautifully timed surprise attack, and the carrier was theoretically raked from stem to stern with a hail of machine gun bullets. Their blue tails showed them to belong to the enemy—VB Squadron 1 off the "Lexington."

Soon after them came the formation of heavy bombers, floating lazily overhead in perfect symmetry, and protected by more single-seaters far above them. Our anti-aircraft gun crews, refusing to consider themselves demoralized by the fear-inspiring diving attack, were busily popping away at the comparatively easy targets, and might have accounted for a fair proportion of the enemy with real shells in real warfare.

The ship had continued to steam northward towards Panama, and at eight o'clock the first of our returning fighters were sighted. Before they were all aboard other squadrons had found the ship, too, and were circling in their respective "stand-by areas," each awaiting its turn to land, so for the next hour and a half, I sat in the after netting as usual, and watched them come in.

One never tires of watching carrier landings, for although the pilots have become so expert that there is seldom even a blown-out tire or a broken tailskid, landing aboard will always remain a ticklish business, and the occasional narrow escapes from more serious damage are perpetually thrilling. As pilot after pilot touches the wheels of his plane on the deck within ten feet of a mark, it looks like the easiest thing in the world, but when a plane finally comes in a little fast and floats across most of the arresting gear, or pancakes down onto the deck with a terrific bounce, one begins to wonder whether any airplanes will last until the end of the cruise! Hundreds and hundreds of landings are made, however, and those original airplanes are somehow still ready for flight every day.

Land was sighted as the last pilot set his T4M down in the arresting gear. The "Saratoga" had received all her planes aboard safely, their missions accomplished without opposition, for they had destroyed the locks at daybreak and had evaded the enemy on the return to the carrier as successfully as they had on the way in.

It seemed hard to imagine any possible defense, even from the air itself, against such an excellently timed attack. And as long as the attack had been delivered, it was of little moment that the planes returned to a carrier which had theoretically been sunk with big explosive shells, aircraft bombs, and (we discovered later) even torpedoes from an enemy submarine. In a word, we had accomplished our mission.

The prolonged tension of the attack was over as we realized that for the first time in the history of the annual manœuvers of the United States Fleet, aircraft had been depended upon to deliver the crushing blow, and scores of the best fighting and bombing airplanes in the world today had delivered that blow with unchallenged success. Aircraft operating at sea with the fleet must hereafter be recognized as a vitally important part of the Navy's offensive power.

Past and Future Events

June 14—Opening of first daily transcontinental air-rail passenger service by the Aviation Corporation, through its subsidiary Universal Aviation Corporation, in conjunction with the New York Central and the Atchison, Topeka and Santa Fe Railroads. The transcontinental fare is about $250. The flying sections are between Cleveland and Garden City, Kansas. Feeder lines are being established. Tri-motored Fokkers are being used.

June 19—First tests in Guggenheim Safe Aircraft Competition at Mitchel Field, Long Island. There were six entries from the United States: Shroeder-Wentworth Company, of Glencoe, Ill.; Charles Ward Hall, of New York City; Heraclio Alfaro, of Cleveland; J. S. McDonnell, Jr., and Associates, of Milwaukee; Curtiss Aeroplane & Motor Company, of Garden City; and Brunner & Winkle Aircraft Corporation of New York City. There were also six entries from abroad: The Cierva Autogiro Company, of London; the De Haviland Aircraft Company, of Edgware, England; the Gloster Aircraft Company, of Cheltenham, England; Handley-Page, Ltd., of London; Vickers, Ltd., of London; and the Societa Italiana Ernesto Breda, of Milan, Italy.

June 27-28—Registration for Summer School Special Course for Training of Teachers for Transport Pilot's Ground School at New York University.

June 27-30—International Light Plane Meet at Amsterdam, Holland.

June 29—Dedication of "Sky Harbor," Chicago, in charge of Gray Goose lines. Club facilities for travellers are available.

June 29—Official opening of the Long Island Aviation Club, member of Aviation Country Clubs, at Hicksville, L. I., N. Y.

July 2—Opening of series of radio broadcasts, NBC hookup, "Roads of the Sky," by Secretary of Commerce Robert P. Lamont. Speakers every Tuesday night will include Captain Frank Hawks, Herbert Hoover, Jr., W. Irving Glover, Wesley Smith, E. Hamilton Lee, Lieut. Apollo Soucek, Erik Nelson, F. Trubee Davison, William P. MacCracken, and David S. Ingalls.

July 6-8—Air meet and dedication of Bradford, Pa., airport.

July 6-8—Dedication of Port Columbus, Eastern Air Terminal, T. A. T., Columbus, Ohio.

July 17-27—Seventh International Aero Exhibition, Olympia, London, England.

August 24-September 2—National Air Races and Aeronautical Show, Cleveland, Ohio. Cliff Henderson is managing director, and has been named to have charge of future expositions sponsored by the Aeronautical Chamber of Commerce. The exhibits will be at the Cleveland public auditorium and the Races will be held at the Municipal Airport.

September 6-7—Schneider Cup Race, Cowes, England. So far the United States has no official entry, though it is understood Alford Williams is being privately backed.

September 28—Gordon Bennett Balloon Trophy Race, St. Louis, Mo.

October 5-21—National Air Tour for the Edsel Ford Trophy, covering approximately 4,400 miles, with stops tentatively arranged at Windsor, Toronto, Ottawa, Montreal, Portland, Boston, New York City, Philadelphia, Baltimore, Richmond, Charlotte, Greenville, Savannah, Jacksonville, Macon, Atlanta, Nashville, Louisville, St. Louis, Kansas City, Des Moines, St. Paul, Wausau, Milwaukee, Moline, Chicago, Kalamazoo and Detroit.

October 12-27—Southwestern Aircraft Exposition, State Fair Grounds, Dallas, Texas.

October 15—Start of South American Trade Extension Flight, a five months' tour of over 40,000 miles through Latin and North America, sponsored by the American Manufacturers' Export Association. Members of the crew will be Donald C. Beatty, Leslie A. Walker, Robb C. Oertel, W. O. Browne, Orin C. Welch and Harry Pascoe.

December 1-9—International Aeronautical Exposition, Chicago, under auspices of Aeronautical Chamber of Commerce.

AERONAUTICS

for September

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Shall We Have a National Air Academy?

(Continued from page 9)

tralized command, and *esprit de corps* in a unit capable of swift and deadly action.

A few years of flyers graduated from the great national air academy we advocate, would definitely secure us safety and peace. In an era where sufficient planes can be landed from a fleet of submarines to paralyze the nerve centers of the entire Eastern coast and wipe Washington off the map, this is not a guarantee to be lightly rejected.

The time is undoubtedly shortly coming when most passenger traffic over long hauls, and even possibly short jaunts, will be by air. Practically the entire mail will be transported by plane. It is an open question as to whether most perishables will not find this method of freightage the more economical in the long run. Any commodity in the sale or shipment of which time and turnover is an important element, will rapidly see the advantages of the sky-roads.

The nation which controls the air will have both military and commercial supremacy. The two are so intertwined that it is difficult to say where one begins and the other leaves off.

Under this prospect it is the wildest sort of folly not to properly fund American air development. Under existing circumstances this is practically an impossibility. There is no lobby devoted to the air, seeking the necessary money, and no focal point from which expenditures may be properly oriented. The air service remains a mere new incident jumbled into an old program.

The spotting of popular and official attention upon a great air academy would serve to relieve this difficulty, and would speed the entire development of the aeronautical industry. Valuable discoveries and greater efficiencies would be accelerated. Manufacturers of planes, equipment and engines whom it is now practically impossible to subsidize, would find a ready and increasing market for their products. The large sums spent in national defense would add to everyday common good in a manner impossible to the present military and naval establishments.

Rear Admiral Moffett, apparently in answer to this latest effort for a unified air service, said recently in an address before the International Association of Lions Clubs: "It is ridiculous to say that aircraft will supplant surface vessels . . . . those who say so do so from ignorance.

"Aviation has abolished and will replace nothing. It will not interfere with other means of transportation, railroads, car lines, busses, steamships and other maritime transport, but is supplemental to them. Similarly in national defence and especially at sea."

All sane men will agree that the Navy has done more for the furthering of aeronautics than any other single agency. Admiral Moffett in particular, in spite of his vivid description of the mentalities of the proponents of a separate air ministry, has been distinguished for his intelligent and able direction of naval flying. This development was vital and necessary and the annals of aeronautics will accord him a high place.

The time has come however where the accessory is of more real potential value than the parent body. Broken into chunks and hitched onto a number of other kites aeronautics will continue to be ænemic and its progress hindered. The idea that aeronautics can be made "supplemental" or incident to any other activity is intolerable to qualified development of the airways and the air supremacy which this nation demands.

That a large number of able and intelligent minds are fully in accord with our contention is indicated in numberless newspapers which came out editorially in support of the policy advocated by AERONAUTICS, and in many personal messages of accord.

The Wichita Beacon says:

"William B. Ziff, publisher of the magazine AERONAUTICS, gives national prominence to the movement to build a national aviation academy . . . .

"A great national academy, to aviation what West Point is to the army and Annapolis to the navy, he goes on to say, should be located in the Middle West near the center of the country, for reasons of public policy and inaccessibility to attack.

"The United States eventually will have a great university of this description. It will be entirely financed by the Government. It will be supported by the Government and will be directly under governmental supervision, of course.

"This academy will be under way, authorities predict, immediately after the proposed air ministry is formed as a part of the presidential cabinet."

Commenting on General Mitchell's recent articles in AERONAUTICS the Trenton, N. J., State-Gazette says:

". . . . The reason for our alleged neglect to keep up with the progress of aeronautical development, General Mitchell believes, lies in our failure to create a department of Aeronautics separate from the army and navy, as the English, French, Germans, Italians, Russians and Spanish have done. General Mitchell's criticisms of our military aviation policies

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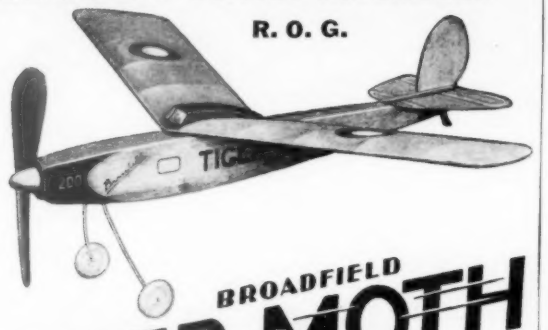

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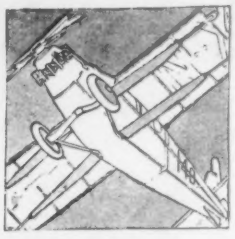

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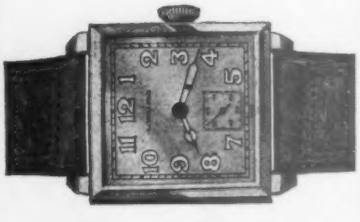
. . . . When they reached Paris the three French aviators cabled as follows: *—Your watches proved most useful during our trip. Their reliability is beyond all praise.*

. . . . The Green Flash in which Capt. Yancey and Pilot Williams are to fly from Old Orchard to Rome is also equipped with Longines timepieces exclusively.



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are in his characteristic decisive and even harsh tone. It is altogether likely, too, that they will prove, as in the past, difficult to combat."

The Indianapolis Star states:

"A campaign for a governmental school to train aviation officers is being conducted by AERONAUTICS, which has an editorial in its June number making a vigorous protest against neglect to give the air service adequate consideration in our defense program. The argument is advanced that the air forces are no longer experimental nor even accessory to others, but have become our most important line of defense. As such they should be given a status independent of the army and navy branches, but co-ordinate with those two arms of the service.

"The suggestion is made by the Chicago publication that a school to rank with West Point and Annapolis should be established in the Middle West, at which young men might be trained for the air service. The selection of students should be made as are those for the military and naval academies and the examinations should be rigid. The object would be to build up an air organization as highly trained as are the men in charge of the army and naval affairs of the country.

"The suggestion seems worthy of serious and early consideration. The airplane is in its beginnings. Nobody knows what is in the future, but the most stupid observer recognizes that aviation is destined to become a vastly more important thing than it is at present. The airplane has developed in the last decade until it is incomparably more effective, as a weapon of offense and defense, than it was in the world war. As much greater improvement may be expected in the next ten years.

"While it is not likely that air forces ever will wholly supplant land and water fighters, the progress of aviation is changing the relative importance of other factors in warfare. It is easily possible that aircraft and those in charge will be the dominating elements in our defense program in a few years. The prospect is such as to entitle the aeronautical division to a better rating than it has now or seems likely to get as a subordinate of another department."

The Honolulu Star-Bulletin writes:

"We in mid-Pacific are much interested in the proposal as voiced in AERONAUTICS that a military college for the training of young officers in aeronautics should be established in the Middle West. Our own experience in the necessity for trained aeronautic officers, and in the need for developing 'airmindedness' generally, shows the value of putting special emphasis on air education."

The Ranger, Texas, Times states:

"The suggestion for a separate military college for the air service is a common sense idea."

The Cincinnati Enquirer remarks:

"West Point and Annapolis are prideful and essential institutions of this government for the purposes for which they were designed—to culture and prepare men for the duty efficiently and intelligently to defend the Nation and all that it now means or may mean.

"It is not, therefore, a wild or exaggerated or chimerical proposal that the Government should have also a great central academy where the young men of the country might be instructed in the art of aeronautics according to the methods adopted and applied by the great military and naval institutions indicated.

"That a separate college should be built for the training of young officers for the aeronautical military service seriously is being urged by eminent aviation experts and statesmen interested in the future of this science now so important in the military calculations of the world.

"As to location, why not in the Central West, in the Ohio Valley, near Cincinnati, in fact, where there are first-class airports and wide expanses for maneuvers and practical demonstrations to students. . . ."

The Houston Post-Dispatch says:

". . . . the suggestion put forth in AERONAUTICS for June, that congress create a new and separate line of defense with its own chief and officers — men schooled to the air, to whom it is their whole existence—is worthy of consideration. The further suggestion that an air college, corresponding to West Point Academy for the army and Annapolis Academy for the navy, be established in the west or in Texas, to which young men might go by rigid appointment, as they do to the existing academies, calls for a practical move in aerial defense development. If we ever have another war, a great deal of the fighting is going to take place in the air. It is not the amount of aerial fighting that will count so much, however, as the bearing it will have on the course of hostilities on the ground. The nation supreme in the air will be invincible."

The Akron, Ohio, Journal states:

"In the June number of AERONAUTICS a new deal is demanded from the bureaus which have been trying to stifle the development of the air service. AERONAUTICS minces no words when it says . . . .

"Akron will have a good measure of sympathy with these conclusions. Its air industry has had to fight every inch of the way for recognition at Washington. The only amendment it could suggest to the plan proposed by AERONAUTICS is that that new aviation academy ought to be located in the Akron district, home of the industry that has pioneered most of the progress which aeronautics has made."

The Wichita Eagle's columns carry:

"Wichita will take a definite stand through civil and social organizations in awakening the country to the need of a school of aviation and also in agitating the public with regard to the establishment of a separate air ministry for the United States. The action began yesterday at a meeting of the Lions' club when members heard a talk by William B. Ziff, president of Aeronautical Publications, Inc., Chicago, who is here sounding out air-minded citizens on the two moves . . . ."

It is our sincere belief that the great national air academy will be a fact in the near future, despite the apathy of official Washington, the peculiar self-flagellating caste system now binding the wings of the industry, and the inertia which always handicaps the furthering of new and progressive enterprises.

AERONAUTICS intends to keep the subject live before the eyes of both industry and public, and will welcome all constructive comment.

In adherence to the high standards we endeavor to set for this publication, AERONAUTICS will present in its regular columns in addition to the distinguished proponents of its editorial views on this subject, the opinions of other authorities who are opposed to these proposed reforms, so that both sides of the question may be properly aired.